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THE STUDY OF PLANT BREEDING

By Herbert J. Webber

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PLANT breeding has been mainly considered from the stand-point of the Art rather than the Science. The all attractive, dominant idea in breeding is to produce something new, "to make two blades of grass grow where one grew before." It has been too largely the aim to develop into the wizard, by wonderful productions that savor of the supernatural and bring the producer into the lime light of publicity. Owing to the cost attending breeding work and the necessity of reaping financial reward, breeders have often intentionally or otherwise favored and abetted the wizard idea, allowing the belief to gain credence that they are favored above ordinary individuals in their perceptive powers. This keeps poachers off the field and advertises their business. The writer does not wish to attribute dishonesty of purpose to such breeders, indeed some such breeders have been of inestimable value to the world. He however wishes simply to emphasize the fact that the methods of breeding are based on natural laws, some well understood and some as yet very imperfectly known.

The prosecution of breeding as an art has in a sense been detrimental to the development of the science. Many thousands of breeding experiments have been carried out, and important new varieties produced without adding to our knowledge of the underlying fundamental laws. The writer may say this with good

grace as he must in some measure plead guilty of practicing the art to the detriment of the science. Many of the laws of breeding were made known in the early part of the 19th century. Sufficient was known, indeed, to allow the development of a well formulated method of breeding, which has been perfected from time to time during the last century. Yet we remain today in this country without a comprehensive manual or text book on this important subject. In the German we have one creditable manual. "Die Zuchtung d. Landwirtschaftlichen Kulturpflanzen" by Früwirth which is not yet completed, three parts having been issued. As in the case of many methods of farm practice, breeding methods have been worked out laboriously and found to exist, without in many cases a clear conception of the reasons why. We do this way or that way because John Doe did so and achieved results.

The subject of breeding has within the last decade grown into prominence and has come to be recognized as one of the most important lines of agricultural investigation. Numerous investigators are now bending their energies to the task of working out the fundamental laws of breeding and the literature of the subject is growing by leaps and bounds. Courses of instruction in breeding are gradually being introduced into the curriculum of study in some of the agricultural colleges and our knowledge of the subject will soon be classified and sys-

tematized so that it may be presented to the student in an attractive manner.

The science of breeding consists in the classification, from the breeding standpoint, of knowledge derived from the various primary sciences, mainly botany, zoology and chemistry. The good physician seeks aid from the schools of allopathy, homeopathy, osteopathy or any other opathy which will enable him to advance the science of medicine and save his patient, who with all the opathys should thus be very patient. In like manner the plant or animal breeder must seek his information from all the ologies, and must even bring to his aid the formulas and principles of calculus, for who could read such classical studies on heredity as those of Carl Pearson without such knowledge.

In taking up the subject of breeding, therefore, the student should not expect an easy task. One of the mistakes of some students even to-day is to assume that agricultural study is a "snap." It may be a soft snap as presented by some instructors and in some places, but if the student is to do the subject justice, it is one of the hardest and most profound subjects which could be selected. Remember that breeding is only one small factor in agriculture, yet to be a scientific breeder requires a thorough understanding of the laws of reproduction, sex, heredity, and evolution, subjects which have occupied the minds of such investigators as Darwin, Wallace, Huxley, Galton, Romanes, Agassiz, Hückel, Weismann and scores of others through their lives. These men dealt only with natural laws, not their application to the production of things of value to man. The breeder must not only understand the laws of heredity and evolution, but must understand the practical side of the question if his work is to meet the full fruition which it should. He must know his plant thoroughly, its botanical history, its chemistry, its agriculture, its pathology, its uses, and know these factors thoroughly in order to realize what improvements are desired from a practical standpoint,

what it is probable can be obtained and know how they can be produced.

The writer does not wish to impress his readers with the difficulty of the subject, as every hour expended in the study is a pleasure and brings forth something novel and interesting. He does, however, wish to impress them with the dignity of the subject. One can learn the art of breeding and probably succeed very excellently in producing new and interesting sorts without entering the scientific domain. If, however, they approach the subject as a student, earnestly searching after the unknown, they will find boundless fields still untrodden awaiting the master mind to conceive and correlate the new facts and principles. The study of breeding is largely the study of the origin of species controlled and directed by man, and as Whitman has said, "the problem of problems in biology to-day * * * is the origin of species." No other problem since the appearance of Darwin's "Origin of Species" has attracted so much attention and occupied the undivided attention of so many great minds. Yet this great problem is still with us to be solved, and an ever increasing corps of workers are bending their energies to its solution.

In order to show the bearing of the various sciences on breeding, let us take as an illustration the problem of improving potatoes, which is one of the great crops in New York, and note what sciences we should have to draw from in conducting the investigation. We should first consider the problem from an economical standpoint to determine whether it is "worth the powder" so to speak, which will have to be expended in the investigation. We refer to statistics and find that New York stands first among the states in the production of potatoes, yielding in 1905 a crop of 30,029,020 bushels valued at \$21,020,314. It is thus an important crop to consider. We learn from statistics furthermore that in yield per acre in 1905 New York ranked 31st among the states—averaging only 70 bushels

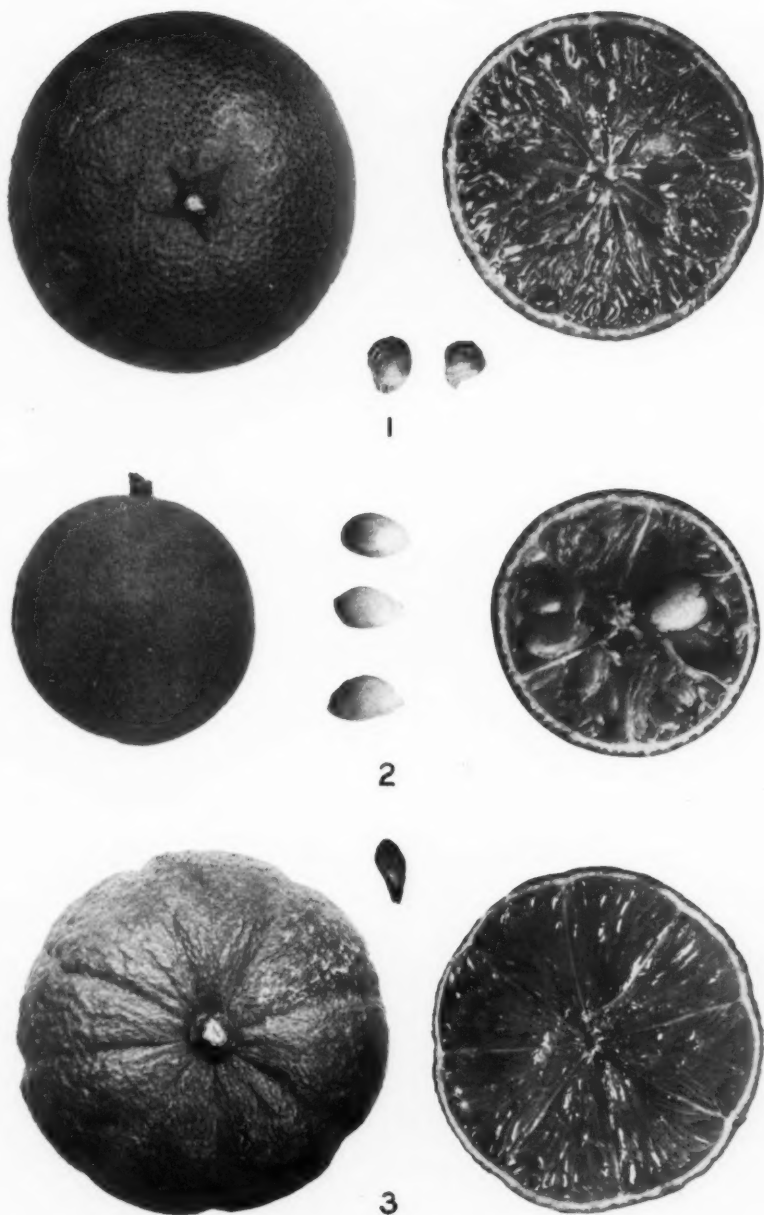


FIG. 1 RUSK CITRANGE (common orange x Trifoliate orange) FIG. 2 ORDINARY TRIFOLIATE ORANGE
FIG. 3. WILLITS CITRANGES (Trifoliate orange x common orange), (all natural size).

FIGURES 1 and 3 graphically show the contrasting results of opposite crosses of the same fruit. These Citranges will grow from 300-400 miles north of the present range of orange cultivation.

per acre, first in total yield but 31st in yield per acre. Surely something is wrong and there must be a chance here for the breeder.

The next step is a careful study of existing varieties and species. The different wild species should be secured from various parts of the world and their characters studied in comparison with the characters of economic value in the cultivated sorts.

The yield, quality, saleability and food value of product, the susceptibility to various diseases, drought resistance, adaptability to required condition of soil and climate, and other factors must be studied of each variety and species to know their good points and their short comings. This preliminary study is necessary to determine what varieties to use as foundation stocks for selection, or what varieties should be hybridized to secure certain combinations of parental characters. We require here a knowledge of plant pathology, systematic botany and chemistry to test our product. We must understand the influence of climate and soils on the various plants and must study the range of variation in the different characters of each plant. This study which is preliminary is of the highest importance and is a fine training in the power of observation and judgment.

We will assume that we decide that one important line of investigation is to test the idea of rejuvenating and invigorating some highly productive variety yielding tubers of excellent cooking quality and rich in starch, but very susceptible to disease and adverse weather condition, by infusing into it some of the heritage (blood) of a wild species. We must now study the botany of the flowers and the methods of hybridization, and make numerous hybrids which we label and watch carefully and preserve the seeds from, separately in the fall. The next spring the seeds from each hybrid should be planted separately and labeled. In these processes of seed saving and planting the student must study methods and learn system, and above all patience and persistence, two

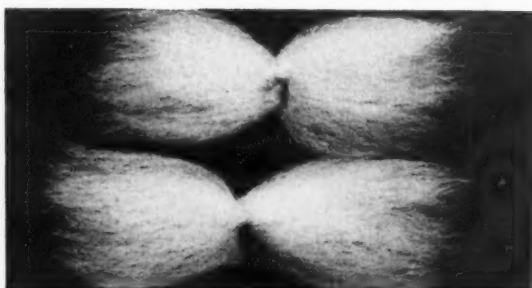
good qualities in any walk of life.

When the first generation hybrids are growing their characters should be studied in comparison with the characters of the parents, and this careful study of the characters of each plant of each hybrid must be continued throughout the life of the plant until the crop is harvested. Here the student is lead into the study of heredity which to the writer dominates all other studies in the realm of human activities in interest and fascination. He must study the pairs of characters exhibited by the parents, and their inheritance in the progeny in accordance with Mendel's famous principles of heredity. He must use statistical methods of studying the variations and devising curves to portray them graphically.

The different types of plants exhibited in this first generation must be clearly distinguished and seed plants selected of each type. The flowers of these seed plants must be manipulated and cross and self fertilized in different ways to secure seed for the next generation.

When this seed is planted and the second generation is produced, in most plants at least, the breeder, if he is inexperienced will be surprised by the enormous number of different kinds of plants produced. It will seem as though nature had become confounded and developed into chaos. Yet owing to Mendel's researches we are beginning to see order in this disorder, and the student has before him the herculean task, if he has used large numbers of plants, in discovering the order in which the various pairs of characters, represented in the parents, have split up if indeed such an order exists which is now certain in some few cases and very doubtful in many others. This is a task which will tax to the utmost the keenest powers of perception, require the judgment of a Solomon and the patience of a Job. The variation in all characters must be studied, however, and systematized in the best possible way in order to enable the student to determine which plant among the many shows the best

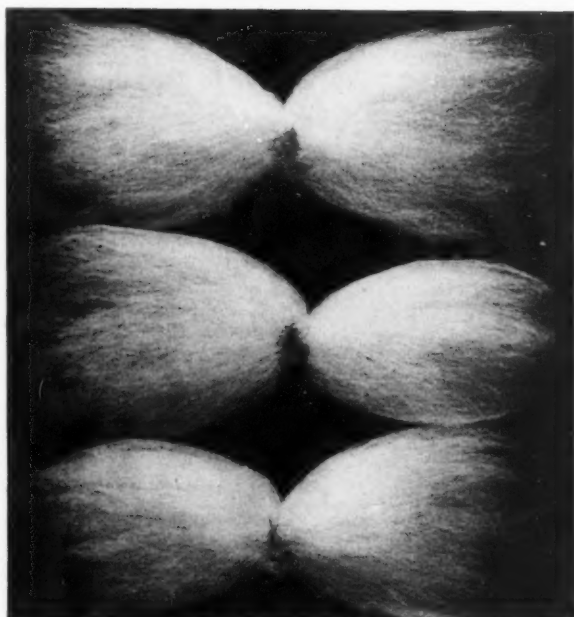
1ST GENERATION



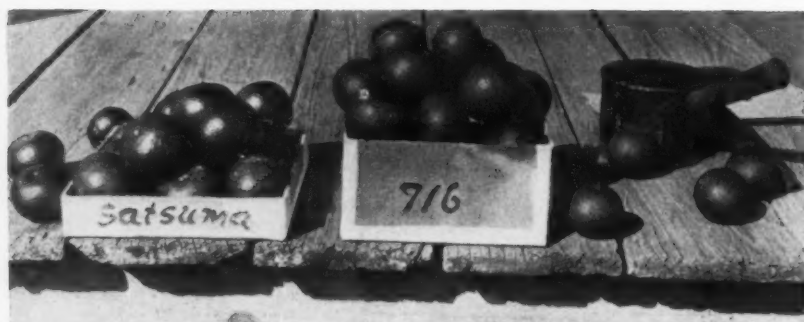
2ND GENERATION



3RD GENERATION



IMPROVEMENT IN EGYPTIAN COTTON BY SELECTION. The improvement which can be produced by straight selection in length of lint is well shown in the above photograph. The Stamma Egyptian when first imported by the Department of Agriculture produced a comparatively short fibre which was scanty on the seed. After a few years of selection, strains were secured producing much longer fibre of uniform length which was furthermore much more abundant on the seed, as is plainly shown in the photograph. The experiments in Egyptian cotton conducted by the Department have not yet reached a successful conclusion. It has been proven that the quality of fibre desired can be produced in many parts of the United States, but the varieties must be improved in yield before they will be rendered thoroughly satisfactory for cultivation under American conditions.



GROUP OF WESHART TANGERINES (center), WITH PARENT VARIETIES DANCY TANGERINE (on left) AND PASON BROWN ORANGE (on right).

combination of parental characters to fit it for use in the desired field. The plants must be studied to determine which one or ones produce the most tubers of the best size and form and most uniform in size and shape; which is the richest in starch and possibly other nutritive elements; which possesses the best cooking qualities and flavor; which has the tubers bunched in the hill in the best way to enable easy digging; which is the least subject to disease in the tubers or tops; etc., etc. No one can comprehend the number of vexing questions that arise in making such selections and the difficulty of making accurate judgments, who has not had the experience of such a study.

Our potato experiment would have to be carried through the 3, 4 and 5th generations, and probably further to yield desirable new varieties, but the methods employed would be the same as in the first and second generations.

If the student pursues his study scientifically he is led into the intricate problems of heredity, and strives the application of the best cytological methods to discover a protoplasmic mechanism of heredity. Fortunately would he be who could demonstrate the hereditary granules, ids or chromomeres representing characters or groups of characters and their method of transmission in sexual unions, their segregation, etc. At every period in the investigation of breeding we soon pass the limits of the explored field and enter the boundless unknown.

To every farmer the field of breeding, whether in plants or animals, furnishes an interesting and profitable diversion. Plant breeding especially should become a farmer's fad. Few can afford to breed animals in a way to secure important results owing to the expense. No farmer, however, is so poor but that he can have his breeding patch of corn, cotton or potatoes. Indeed if they but knew it, they can ill afford not to have such a breeding patch to furnish seed of their staple crop for their own planting.

To the student the field of breeding holds promise of rich reward. It is teeming with problems awaiting solution. It embraces the most interesting parts of Biology, the study of sex, fecundation, heredity, evolution, influence of environment, variation, physiological studies in forcing and producing variation, etc. It gives a broad view of nature and carries the naturalist into the domains of practical utility, bringing him in touch with his fellowmen and their wants. It is great to study science for science's sake but how much greater it is to study science when we know that our results will be welcomed, appreciated and utilized by thousands of our fellowmen. To add something of value to the store of useful knowledge, which will benefit and lighten the labors of the millions of farmers who toil and drudge that the world may live, is an aim worthy the best effort of the keenest intellect.

SELECTION, A FACTOR IN PLANT BREEDING BY A PRACTICAL MARKET GARDENER

By O. G. Bishop

Pontiac, Mich.

CERTAINLY, no one realizes more fully how poorly equipped by lack of technical training and early education along horticultural lines, the writer is than he himself. It has only been by the most laborious study under unfavorable conditions, and the continued kind encouragement and assistance of Dean Bailey, and others, that what little knowledge of plant lore the writer possesses, has been acquired. Therefore, if any of the statements made bearing upon plant physiology are not in accordance with sound reasoning, they must be pardoned, as the writer admits that most of the work has been done by the rule of thumb.

To me it seems impossible to be a gardener and not at the same time be, to a certain extent, a plant breeder for the gardener who handles large quantities of fruits, flowers and vegetables soon realizes that it is the fruit, flower or vegetable that fulfills his ideal and attracts his attention, and not the general run of the crop. Dean Bailey says in his plant breeding that the real work of the plant breeder begins when the selection begins. This is absolutely true, and is shown by the great variability of a crop grown from commercial seed. The grower is only too often responsible for this by taking too much into consideration, the price, and not the extreme quality of the seed he purchases.

There is nothing theatrical about plant breeding. One does not start out in the morning to make a certain number of crosses, or select any certain thing, but should constantly keep his eyes open for a chance variation in the right direction, and for the bush or plant that is to be taken as a mother plant. A plot of tomatoes or peppers soon ceases to be a plot as a whole, but resolves itself into a number of individuals with very vary-

ing characteristics, the most perfect of which it is desirable to perpetuate, and the opportunity to do so must not be lost because it may never again appear. The habit of observation must be trained to its fullest extent. The young plant breeder must not imagine he is going to have wonderful results immediately. If he does, disappointment awaits him. There are many many attempts that end in nothing. There is, however, a great amount of satisfaction when you see something you have accomplished. It takes away the drudgery to a large extent, and you cease to be the automaton of the general rule, but you are the one who leads and sets the pace for others.

You will not have several new things a year, not by any means. If you have one, you do well. There is more need for plant selectors than breeders, and one must be careful to perfect as far as possible, before allowing a selection or hybrid to be introduced. Even then constant selection must be kept up to maintain a supply of stock seed that is properly representative. So it follows that you may produce very few new strains.

The gardener is, by necessity, a plant breeder. His market demands a product of a certain character. It was this, that led me to make my first trial. The purple tomato, alone, will sell here. There was nothing earlier than Acme and this lacked size and shipping quality, so it was crossed on Magnus and then the selection began, saving perhaps only one or two plants from a thousand, keeping the same ideal fruit in mind, the same character of plant always viewing the plant as a whole, never by its individual fruits. After a series of selections, the direct character becomes fixed, or rather so the general appearance is the same.

With fruits such as raspberries that

are propagated by rhizomes the variation is not so great. Still a mistake is made in not being far more particular in the choice of the mother plant, taking advantage of, and assisting natural selection. In my own berry plot the best only are saved. The ones showing the greatest resistance to disease, the branching habit desired, and the extreme quality of fruit. It is perhaps in sweet corn that the greatest opportunity lies. The likelihood of pollination from other fields being so great, extreme care must be taken to select ears of the same character from stalks of the same uniform height. This is taken up so fully by Professor Bailey it is not necessary to enlarge upon it. During the rush of a busy season not enough care is given as a rule to the selection. We are apt to neglect marking the best plants. It is, however, time very well spent as it gives the grower a superior strain that brings a large price in the market, and there is also a probability of the strain being wanted by a seedsman. Extreme size is often attained at the expense of quality. This I found to be the case with Hubbard squash. Too much stress had been laid on its warted shell and large size, while with the Delicious the keeping quality was poor. It was truly delicious in

quality and the desirable medium size. A cross of the two, has after four years given a medium sized squash, the shape of the Delicious, but the hard and warted shell of the Hubbard, and of good quality. With musk melons the fancy ideal of the selector comes into full play, as it is an important crop, and one in which the market varies greatly, some wanting a small or Rocky Ford type, others the Osage. But whatever the type desired it must be adhered to strictly, from year to year, else a new variation is started and the previous work is undone. A seedsman remarked this year, that it was almost impossible to obtain pure stock seed of the old Netted Gem. It is unnecessary to go through the whole list as one would be compelled to do to show what required selection. With the advent of specially trained young men in the business of seed growing and plant breeding it is to be expected that very much will be done, for at the present time growers who really try to do conscientious work, are far too rare. It is not the fault of the seedsmen that their seeds are not always up to the standard, but of the plant breeders themselves. As a rule most breeders lack both knowledge of plant life, and the amount of energy required to do good work.

MEMORIES OF MAY

By P. B. Fletcher, G.

IN my heart there are Mays and the memories of Mays yet all Mays are morning, rose flushed, dew-gemmed, and all mornings are May. Such was the May when we, my boat and I, floated down the quiet, reed banked stream as the first tint in the eastern sky gave promise of the dawn. From the tree-tops, the joyous melody of a hundred feathered throats, love song and chorus and the glad call of mate to mate, growing louder and louder as the flush in the east deepened and deepened. So we floated, my boat and I, through a world of song, through the rose-dawn

out into the heart of the sleeping lake, the satin smoothness of its bosom rising and falling with the slow beating of the mighty heart underneath.

From the cat-tails, the red-wing flashed in the air, his crimson vestments gleaming in the light, his joyous song rising clear above the chiming accompaniment from the reeds below, then fell back. On the hillside the peach buds were not so deep a hue as the sky. One waited breathless, the showering of pink petals from the celestial trees. Louder and louder and louder swelled the chorus from the banks, even the snowy

apple-blossoms were pink-stained with the flush of the coming dawn.

A moment, and the flushing heavens paled and trembled before the coming of their Lord and Master, then Dawn,—the great miracle of the day—touched with his golden shafts the expectant earth, touched the in-

nermost heart of the slumbering lake until she moved and trembled under the caress of his golden fingers, and her soft breath as she woke to life and motion rippled the water into countless wavelets that lapped the rocky shore and the prow of my tiny boat.



Yet there was a May, and now I remember it, a May that dwelt in the Valley of Sunshine, that lies a long way from the maddening city and its world-weary men. A May, rough with huge boulders and ragged stones and full of noise of rushing waters. You and I who have travelled that path know how it begins, this Valley of Sunshine, this place where May dwells eternally,—in the heart. We know the bright Valley, hemmed in on that farther side by the silent forest, huge-trunked, pine-topped; we know the joyous stream dancing in the sunshine, each ripple for an instant, uplifting its face to the sun;

we know the button-wood grove, where graceful candelabra swing their golden censers, yellow touched by the flood of light; a pleasant grove that leads you unaware, through its sunlit aisles to the very altar of the All-Mother.

It was May who purpled the yew-banked slope with hepaticas, it was May who moss-festooned the grey rocks from whose heights crystal drops of Holy Water fell, over the faces of the worshippers below, to the altar steps with the faint tinkle of sweet bells, chiming softly against the deeper murmur of the smiling waters outside.



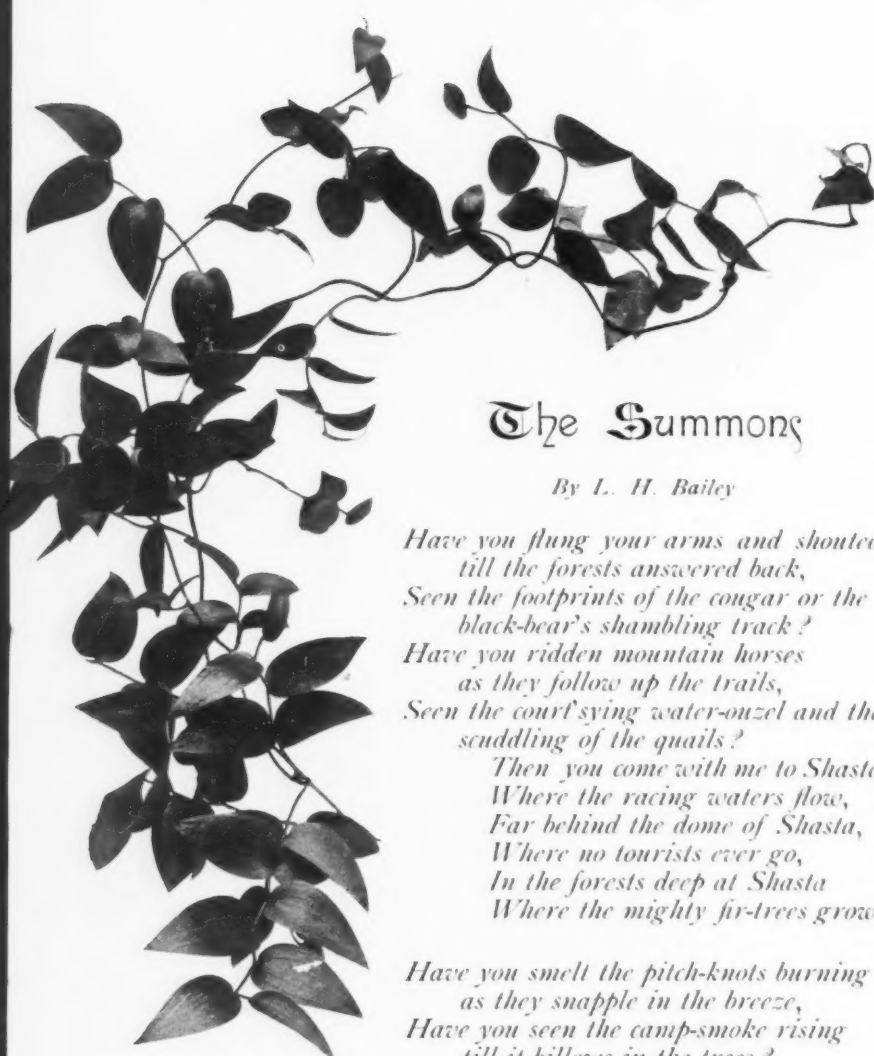
Now I bethink me, not all Mays were thus, for there was a May, that should all the memories of May fade but one, that one should I hold. There was neither morning or sun in the May I remember, only the soft patter of rain drops in the pine forest and the soft babble of a tiny brook at

our feet. There we found her, beneath the thick-topped pine that caught and held each tiny drop, a May full of the never-to-be-forgotten scent of the wet forest, the soft music of the falling rain and the chirp of the tree-sparrow, sharing our shelter.



Another May there was, in the days unforgotten but past, a May that brushed me with her perfumed wings and vanished in the purple shadows of the years that come no more. As she came, my lost May, the purpling shadows deepened on the distant hill-sides. The sun—a fiery globe—sank behind the western fringe of trees, and then came May and twilight stealing o'er the old farm-yard, close-cropped, stone-walled. The faint, weird music of the tree-frogs from the

pasture swamp floated up; the flame in the sky faded to ashen as May's torch bearer lighted the tiny flame, that flickering an instant in the night breeze blazed up in the west, the queen's first star. Then the two children, reluctant, leaving the quiet cattle went their way meadowward to the house, through the cool grass but turned and listened to the soft farewell by fairy voices chanted as May and twilight, hand in hand, sped on their westward way.



The Summons

By L. H. Bailey

*Have you flung your arms and shouted
till the forests answered back,
Seen the footprints of the cougar or the
black-bear's shambling track?*

*Have you ridden mountain horses
as they follow up the trails,
Seen the court'sying water-ouzel and the
scuddling of the quails?*

*Then you come with me to Shasta
Where the racing waters flow,
Far behind the dome of Shasta,
Where no tourists ever go,
In the forests deep at Shasta
Where the mighty fir-trees grow.*

*Have you smelt the pitch-knots burning
as they snapple in the breeze,
Have you seen the camp-smoke rising
till it billows in the trees?*

*Have you stretched full length and slumbered
on the needles for a bed*

*With the sun-flecks dancing on you
thro' the tree-tops overhead?*

*Then we'll go to find the rivers
Where they open to the sky,
Wade the oozy turbid rivers
Where the water-bushes lie,
Feel the salmo in the rivers
As it rises to the fly.*

*Have you heard the boiling waters
when they bubble thro' the night,
Felt the touch of roaming night-winds
as they wander from the light?
Have you breathed the wind of fir-trees
in the silence of the wood
With the night-damps closing round you
where no human ever stood?
Then you join me in the darkness
Where the night is dense and deep,
Stretching silent in the darkness
When the wild beasts lie asleep,
Hear a startle in the darkness
Where a panther makes a leap.*

*Have you heard the rain-drops tinkle
as they strike upon the leaves,
Have you felt the fore-winds freshen
when they whistle in your sleeves?
Have you sat beside the river
when the rain begins to pour
So you know the fragrant music
that it makes along the shore?
Then we'll hasten to the weather
Be it rain or sun or cloud,
To the hazy purple weather
And the dust-deeps that enshroud,
To the free and open weather
When the winds are wild and loud.*

*Have you torn thro' thorny thickets,
walked a ten-mile at a stage,
Floated down the falling rivers
past the sedge and saxifrage?
Have you waited at the deer-licks
for the coming of the game?
Have you bivouacked in the forest
till you've clean forgot your name?
Then we'll off into the forests
Where the bubbling waters run,
Shout our challenge in the forests
At the rising of the sun,
Build our night-fires in the forests
When the careless day is done.*

NATURE STUDY AND SCHOOL GARDENS

By John Craig

Professor of Horticulture

THE spirit of nature study is spreading rapidly. The labors of the pioneer teachers in this fascinating field are beginning to yield fruit. Ten years ago nature study expressed a vague and indefinite something relating to agricultural teaching. It is possible to meet this condition to-day, but as a rule system and order are manifesting themselves. I suppose it is true, however, that in no branch of teaching en-

his special field. This means that the things themselves are intrinsically engaging. They furnish the opportunity. The artist provides the dress.

However attractive the things of past ages or the objects representing inanimate matter may be, we must admit that life and its manifestations appeal most strongly to the child. For this reason the plantsman and the student of animal life have somewhat the advantage.



deavor does so much depend upon the personality of the teacher, and so little upon logical order. When it is reduced to the essence of orderliness the pleasure is squeezed out of it for many juveniles.

One of the interesting features that catches the attention of the onlooker, is the ingenuity displayed by nature study advocates in utilizing natural phenomena for the presentation of subject matter in an attractive way. It seems quite as easy for the entomologist—with the right turn of mind—as the meteorologist, the geologist, the botanist, or the physicist, to make use of the subject matter in

Some of our readers will remember an interested group of students from Canada who came to Cornell some four years ago to study nature study, mainly in respect to its pedagogical phases. I have watched with a great deal of pleasure the progress of these men since they left Cornell and took up work in their separate missions in Canada. Each one of the twelve has been directly engaged in teaching elementary agriculture in some form or other during the interval. The school garden has been an important feature and I understand in most if not all cases an eminently successful one.

While I believe in the principle, and the desirability of keeping children, especially those growing up in rural districts, close to plant, animal, and soil studies, I am nevertheless of the opinion that a good deal of school teaching effort of this type does not amount to much. I have seen examples where the exercises were of a most perfunctory character on the part of the teacher, and it goes without saying, on the part of the children. This was due in a large measure to the natural attitude of the children, and to be charged also in part to the manner in which the exer-

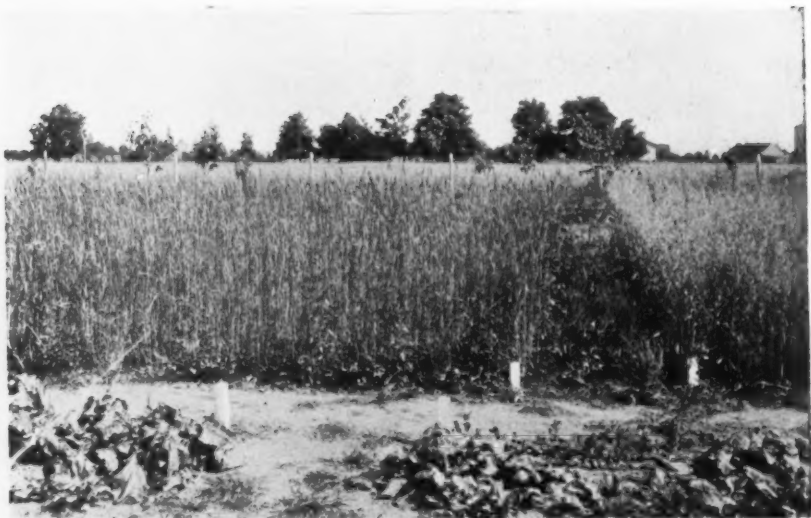
school gardens in the immediate vicinity of that city. The gardens which furnish the illustrations were a part of the nature study equipment of one of our famous "Canadian contingents" referred to above—Mr. Ernest Howes, of Bowesville, Ontario. Nature study work is being carried on in Canadian country schools in two ways. First, by consolidating a convenient number of these schools, providing a staff of teachers among whom is selected one person who gives special thought and attention to the garden work. In these schools the gardens are quite elaborate adjuncts.



cises were presented. I think that some of our enthusiasts in this work overlook the fact that many children have no taste for and no inclination to study elementary agriculture; and it seems to me just about as reasonable to press it upon these, as it would to insist upon the elements of law or medicine.

There are, however, to be seen excellent and inspiring examples of substantial advancement in school garden work in various parts of the country. The photographs which accompany this note were taken and furnished by Mr. R. B. Whyte, of Ottawa, Canada. They were secured in the country

The other method groups a number of rural schools, and provides an itinerant nature study teacher. It is his duty to visit each school periodically, and the work of the schools is so arranged that at the time of his visit all other studies are dropped and the attention of the pupils is concentrated on nature study subjects. This work has been going on for some three years. It has been made possible by the benefactions of Sir William MacDonald of Montreal, and has been directed by Prof. James W. Robinson, former commissioner of agriculture, and now principal of the new MacDonald Agricultural College.



The photographs illustrate the progress of garden work in these schools, and at the same time suggest the scope and character of the field studies. In addition to the conventional flower and vegetable plots, there are plots of grains and grasses. These are in charge of the more advanced pupils, and it is a part of their work to study the variations which are exhibited in the individual plants

of each variety. The best heads of wheat, oats, or barley are harvested separately, and these are sown successively for the purpose of improving the strain. This advanced type of school garden work is only possible at the consolidated school, but it suggests substantial progress and is worthy of being studied by institutions working in similar fields throughout the country.



THE VALUE OF NATURE STUDY AND CHILDREN'S GARDENS

By George W. Carver

Director Tuskegee Experiment Station, Tuskegee, Ala.

FROM my earliest recollections I have been thrilled as little by little the truth pertaining to the common things about me began to unfold. I was the happy discoverer of new worlds and strange creations almost daily. How wonderful and inspiring it all was to me, and is none the less now.

Who has not watched with delight the children as they dug up the earth with their toy set of garden tools, set a few plants, or imperfectly planted a few seed. With what joy and satisfaction they called it their garden and hailed the coming harvest with delight, despite the fact that daily pilgrimages were made and some of the seed dug up to see if they were sprouting. This is but an indication of the child's love of nature.

Prof. L. H. Bailey says that nature study "is seeing the things which one looks at, and the drawing of proper conclusions from what one sees." The above is the basis for all educational systems and the very foundation of all good teaching.

Since the majority of individuals in any large community must earn their livelihood in rural pursuits, it would, therefore, seem wise to educate in that direction. To those engaging in any other profession whatsoever, a knowledge of the common things about them will give a fund of information and educational strength that nothing else will, and serve to better fit them for their particular specialty.

There is probably no agent more productive of interest than children's gardens, which embody almost if not quite every phase of practical rural nature study. If properly presented new revelations and discoveries will constantly be unfolding before the pupil, increasing his enthusiasm and gradually enlarging his educational horizon.

Soon the child learns to look upon

the garden as any other class room, except that it is more delightful, instructive and entertaining. He here, not only selects and lays off his individual plot, which is to be all his own, but learns why this spot is selected for the garden, and another rejected, which to him seems much superior to the first. He is now ready to become acquainted with new tools and a more skillful use of the old, which reduces labor, increases his earning capacity, each of which cannot help but encourage him to go forward. In the preparation of soil, new problems arise, he naturally begins to classify soils by placing them in groups according to their physical composition, color, texture, etc., *e. g.* clays, loams, sand, gravel, and rocky soils are accurately determined. He will also note that some of these soils are much more easy to plow, spade or hoe, he will seek the reason why.

The selection of seed and the glories of testing them come next. He here learns valuable lessons as to the kind, quality and quantity to plant. Innumerable lessons as to how plants grow and feed will be ever before him with increasing interest. Some of the knotty problems in figures can be greatly simplified; the child can easily understand that if he plants 100 seeds and 50 grow that it equals one half or 50% and if 75 grow it equals three fourths or 75% of the whole number planted.

The mysteries of planting are now before him. What a splendid opportunity to study the effects of heat, light, moisture, etc. Cultivation and harvesting now claim their share of the interest and many and varied are the problems they will suggest as the exercises progress.

Marketing may be considered the climax. While it is true all of the other operations have taught their lessons and have been full of interest

up to this point from beginning to end, nothing inspires and encourages like the beginning or swelling of a bank account, or the prompt payment of a debt which becomes due as a consequence of business operations. With what enthusiasm the child watches the growth of the credit side of its garden business.

Among the many valuable things enumerated as well as the many more unsaid, we have observed none more helpful and far reaching than the influence of this garden work in the homes of many of the children. Not infrequently, expressions come to us from grateful parents telling how enthusiastically their children are working and studying the little corner given them for their garden.

Aside from mechanical skill the child gets the most valuable of all pedagogical truths, *e. g.* close observations, correct thinking and logical conclusions.

The average individual appreciates a thing in direct proportion to his knowledge of it. Ignorance has its diversions that entertain for a while

but they soon become tiresome.

I think I make no exaggeration when I predict, that if a small plot of ground, (a window garden if nothing better can be had) were set apart, properly directed by a competent teacher, who would unfold before the child's wondering eyes the glories of plant and animal life, and the mysteries of mineral existence. Thousands of the brightest and best of the youths of our land would delight to remain, improve and beautify the old homestead; a corresponding number would hail with delight the opportunity to leave the crowded city where there is always such a struggle for existence.

We would no longer see thousands of acres of land, desecrated, abandoned to the wild brier, the thorn and the thistle, but in their stead every acre would be made to produce a hundred fold, even greater than that of their virgin fertility.

Let us hope that nature study will continue to grow and flourish until the fullest measure of the almost limitless possibilities of this ideal method of teaching is realized.



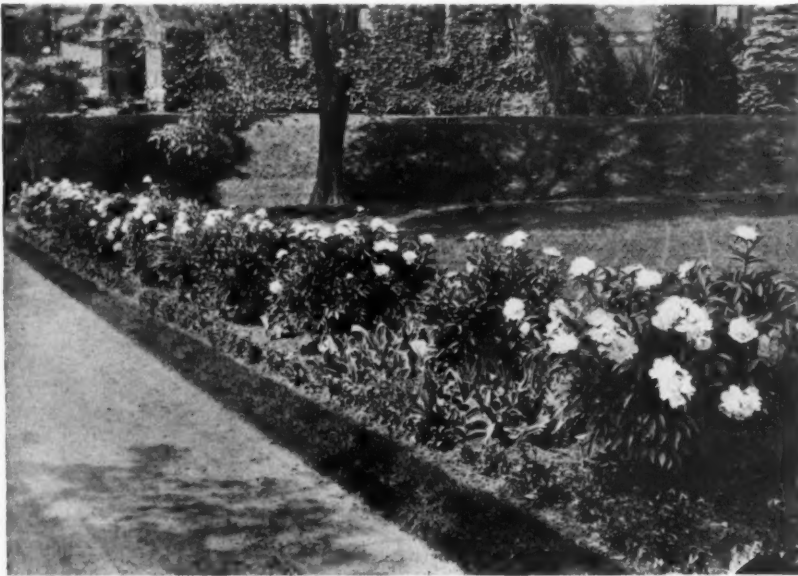
A SOUTHERN SCHOOL GARDEN

THE PEONY OF TO-DAY

By J. Eliot Coit, G.

IF you mention the peony to the average American of to-day, the image which presents itself to his mind will usually be that of the old double red of our grandmother's garden. It is large and very very red; and an odor like that of soft soap pervades its thickly set petals. This peony is a native of Southern Europe, and in tracing back its history we find that it fades out in the mythology of

America. Among these was the Siberian herbaceous peony known botanically as *Paeonia albiflora* and listed in most of the trade catalogs as *P. Chinensis* or (*sinensis*). Seedlings of this species when brought to Western Europe and America showed a wide variation from the type. The golden stamens began to transform into petals and soon a host of forms in all degrees of doubling from the



PAEONIA ALBIFLORA IN THE BORDER

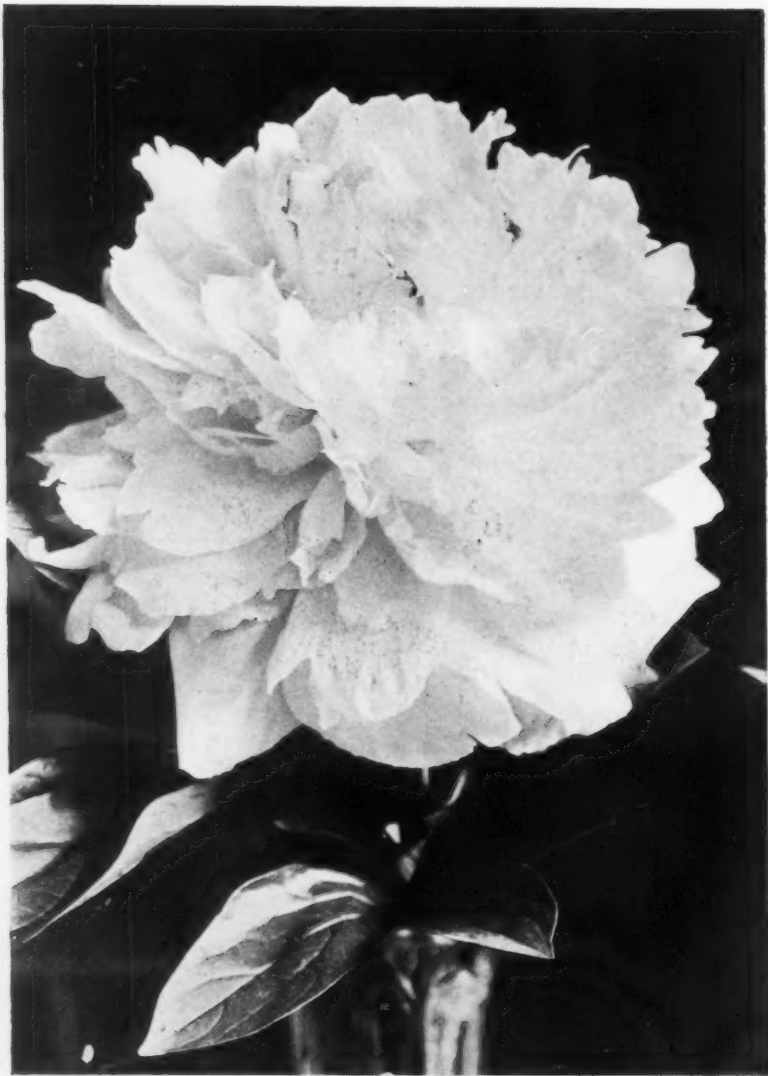
the Greeks. It has had much to do with popular superstition in regard to the treatment of diseases, but in an ever lessening degree even down to the present day.

The peony of to-day, however, is a very different plant, and it is of this new race which is so rapidly springing into popularity that I have been asked to say a few words at this time.

With the opening of the Chinese Empire and Siberia to the outside world many new plants were secured which have been of untold benefit to

single such as *La Fiance*, *Through Glory* to the perfectly double, such as *Festiva Maxima*. They also presented all shades of color from white to dark red. Many of these new forms are possessed of a fragrance which rivals the rose. Peonies are ordinarily propagated by division of the fleshy roots, and when once a valuable seedling is secured it is a simple matter to keep it true.

Another characteristic of this Siberian peony which has brought it



AVANCE. A GOOD DOUBLE WHITE GROWN BY A. H. FAWKS, NEWTON
HIGHLANDS, MASS.

into great demand in America, is its hardiness. Coming from the cold and rigorous climate of Siberia, this plant is well able to stand our northern winters, and has proved itself to be the coming flower of our great Northwest. Out on the cold, bleak, and treeless prairies of the Dakotas, this

lovely flower will thrive in any doorway with little attention save a handful of straw tossed over its roots in the fall. No farmer's wife of the western plains should be without peonies for they will go far toward solving the problem of her flower garden.



GLORY. A NEW SEEDLING OF THE JAPANESE TYPE

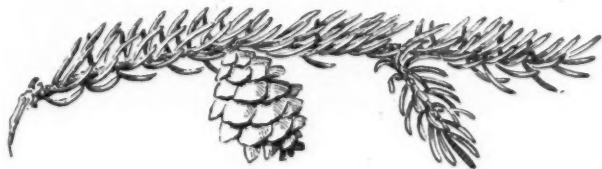
Unlike many of our other introduced plants the Siberian peony has not as yet been seriously attacked by disease or insect, and the total trouble from both of these great foes to plant health is so slight as to be negligible.

The Siberian peony is also a commercial flower and is being grown in ever increasing quantities for sale in our city markets. They ship well, stand cold storage well, and many varieties will last more than a week after being cut and set in water in a cool room. They also are coming more and more into demand for decorating work.

It is true that the varietal names of the different forms are at present in

very great confusion, but the American Peony Society has undertaken the work of correcting and systematizing these names and it is confidently expected that their work will result in much good in this direction.

Perhaps in closing I cannot sum up better than by quoting from Mr. H. Hufelen, of Le Roy, N. Y., who in considering the Siberian peonies says: "Massive without being coarse, fragrant without being pungent, grand without being gaudy, various in form and color, beyond the possibility of being successfully superseded, they stand in the first rank of hardy herbaceous perennials."



ETHERIZING WHITE ROMAN HYACINTHS

*By J. Taubenhaus, '08**

"**N**OTHING is lost, and nothing is created" said the French chemist Lavoisier. Indeed, as fertile as a mind may be, it can add nothing to that which has been once created. Science claims not the power of creating, but rather the power of improving things. All the dreams of the scientist lie in the devising of

ether is sufficient for a thousand bulbs. Provide a tin box 7"x12"x5" with two perforated shelves in its interior. Put the bulbs upon the screened shelves and spread them well. The ether is poured into a dish and placed at the bottom of the box and beneath the bulbs. The ether is volatile and its fumes are absorbed by the bulbs. The box is closed tightly and all fire is kept away. If there are any ether fumes escaping, its smell will be readily detected and it will indicate that the box should immediately be well tightened. After 24 hours the box is opened again, the bulbs are taken out and planted in pots.

After having etherized the bulbs, the purpose of my investigation was to find out first the influence of temperature upon growth of etherized bulbs, second, to determine whether bulbs after being etherized need a rest or not. For this, I have divided the etherized bulbs into four groups.

No. 1, or those to be forced immediately.

No. 2, or those to be forced after 2 weeks.

No. 4, or those to be forced after 4 weeks.

No. 6, or those to be forced after 6 weeks.

Each group was divided into three sub-groups:

Sub-group 1 to be forced in the hot house.

Sub-group 2 to be forced in the medium house.

Sub-group 3 to be forced in the cold house.

Each group and sub-group of the etherized bulbs had their checks to compare with. Group 1, was forced immediately, the rest which were destined to rest from two weeks and upwards, were plunged in ashes in a cold frame outdoors.

The following table shows the manipulation:



FIG. A

means to help nature in her glorious work.

Every florist knows what it means to obtain his flowers a week earlier, nay even a day. The market also is not indifferent to flowers which have been improved in texture and in size. Ether is an important factor in the forcing of plants, but to get the desired results we must know well the nature of the plant with which we deal.

The process of etherizing plants is very simple. One pound of sulphuric

*NOTE—These studies were conducted under the direction of Professor Craig of the Department of Horticulture as Course 29.

Name	Etherized	Potted	No. 1 Forced	No. 2 Forced	No. 4 Forced	No. 6 Forced	Temperature		
							Hot	Medium	Cold
White Roman Hyacinth	Oct. 12	Oct. 13	Oct. 13	Oct. 27	Nov. 10	Nov. 24	74°F	69°	59°



FIG. B

Naturally, those forced immediately, began to grow first, but the etherized distinctly surpassed the non-etherized in growth of leaves. This distinction was apparent in all of the groups during the first three weeks of vegetative growth, but later there

was apparently no difference in vegetative growth between the etherized and non-etherized.

The blooming period was not the same in the three different houses nor in the four different groups. The following tables exhibit the different results:

Hot House (temperature 74°F.)

	No. 1		No. 2		No. 4		No. 6	
	Ether	Check	Ether	Check	Ether	Check	Ether	Check
Flowering began	Dec. 12	Dec. 13	Dec. 11	Dec. 14	Dec. 20	Dec. 24	Dec. 26	Dec. 30

Medium House (temperature 69°)

	No. 1		No. 2		No. 4		No. 6	
	Ether	Check	Ether	Check	Ether	Check	Ether	Check
Flowering began	Dec. 12	Dec. 12	Dec. 8	Dec. 11	Dec. 18	Dec. 21	Dec. 25	Dec. 30

Cold House (temperature 59°)

	No. 1		No. 2		No. 4		No. 6	
	Ether	Check	Ether	Check	Ether	Check	Ether	Check
Flowering began	Dec. 24	Dec. 30	Dec. 27	Jan. 1	Jan. 5	Jan. 12	Jan. 12	Jan. 14



FIG. C

From these three tables it may be seen that the first to bloom were the etherized No. 2 in the medium house, while the same number in the hot house began to bloom three days later. No. 1 in both the hot and medium houses, produced an abundance of leaves, and very few flowers of any marked value. The succeeding groups 4 and 6 in both the hot and medium houses, while blooming later than No. 2 gave nevertheless good results. The etherized in both cases began to bloom earlier than the checks. It is interesting to see that in the cold house the hyacinths began to bloom after all had ceased in the other houses. However, in each group, the etherized bloomed earlier than the check.

The length of stem and quality of flowers differed between the etherized and checks. Excepting No. 1 in both the hot and the medium houses,

in all the other groups in the three different houses, the etherized flowers were somewhat larger and the stems considerably taller and stronger than the checks.

Fig. A shows the comparison of No. 6 etherized and check in the medium house. The same difference exists in the other groups of the same house.

It is seen that when the etherized hyacinths are in full bloom, the check is decidedly behind. This is the case with all the groups with the exception of No. 1 in both the hot and medium houses.

In the hyacinths, the first flowers to appear are those from the center of the plant. These flowers are generally the strongest. At a week's interval, sometimes less, the secondary shoots also produce flowers, but of a lesser quality. The ether, however, seems to improve these. Fig. B com-

pares No. 6 etherized second crop and check in the medium house. This is the case with all the groups in each of the houses.

It is also known that the hyacinths have a tendency to send out very tiny shoots of one or two leaves each. These shoots do not bear flowers, but when the bulbs are etherized, they do develop tiny stems which bear two or four flowers each. In Fig. C we see this well illustrated.

From what we have seen, the ether appears to do three things:—

- (1) To hasten the blooming period.
- (2) To improve the quality of flowers and size of stem.
- (3) To increase the amount of flowers.

This investigation points with White Roman Hyacinths to three conclusions. First, if we wish to hasten the blooming of the White

Roman Hyacinths, the bulbs may be etherized, then planted in pots and rested for two weeks, thus encouraging the formation of roots. Second, that a medium temperature is best, for too much heat apparently holds them back for three or four days, in addition the larger expense of heating should be considered. Third, if for some reason we have but a cold house available, or if we care not so much for the earliness of bloom as for quality and quantity, we may etherize the bulbs and rest them two, four, six or even eight weeks, and in all cases, and in whatsoever temperature (not less than 50° and not higher than 80°F) the ether will manifest its good influence. The results are stated as applying to White Roman Hyacinths only. It may be found that conditions should differ for each kind of bulb.



THE PURDUE, A NEW STRAWBERRY

A SELECT LIST OF TECHNICAL BOOKS FOR AGRICULTURAL COLLEGE INSTRUCTION

By *Thomas F. Hunt*

Professor of Agronomy

THE Agronomy Seminar has been making a study of the text books, laboratory guides or manuals, and copyrighted books of reference in the various technical subjects, such as are ordinarily taught in an agricultural course of University grade. The editor of *The Cornell Countryman* has asked permission to publish the list which has been prepared. This study was not begun with the idea that the resulting list of books would ever receive any publicity. In view of the opinion expressed by a well known authority in the last issue of *The Cornell Countryman* that no text book on agriculture of a college grade existed or was in course of incubation, it may perhaps seem unwise to give this list public mention. Besides helping students in the selection of their personal libraries, however, it may help to expose the weakest places in our agricultural instruction and cause some one to begin the desired incubation. According to the above opinion all books must be assumed weak. It is only a question of degree,—weak, weaker, weakest.

Each of about 20 students was assigned a subject on which he was required to report not to exceed five text books, five laboratory manuals and ten books of reference. The subdivisions may be and were the subject of discussion. It is not intended to indicate the best subdivision or a logical arrangement but conforms more or less to the present status of agricultural instruction in courses of college grade. The courses of instruction in agriculture as well as in all other subjects are apt to lack consistency since, like Topsy, "they just grewed." Courses of study have grown out of the traditions of the past and the personal equations of the living and the dead. A strong man here and there has blazed a path according to the exigencies of his surroundings

and others have followed these adventurous spirits.

Neither have all the possible or even all the important subjects been included in this outline. Meteorology and forestry are rather conspicuous omissions.

After each student had presented to the Seminar the books relating to his subject the list was amended and criticized by the various members of the Seminar and this list so amended with criticisms was placed in the hands of a committee composed of the members of the agronomy staff and of post graduate and senior students. The committee consisted of Professors J. L. Stone and G. F. Warren and Messrs. Paul J. White, J. N. Chakravarty and G. D. Dragoshinoff. The committee was requested to recommend to the Seminar two text books, two laboratory manuals and preferably not to exceed five books of reference for each subject, provided that such a number of books were in actual existence and provided that that number of books could be made to cover the subject.

The committee has gone into this subject with considerable detail, having sought in many instances the opinion of experts in the various subjects under consideration. As a result of such study and investigations the following list has been submitted.

In selecting text-books a number of factors have been considered. Does the book cover in a comprehensive manner the whole field under consideration? Does it omit unrelated and unessential matter; in other words, is it both inclusive and exclusive?

Is the subject matter accurately and succinctly stated? It is often better not to know so much than to know too many things that are not true.

Has the subject been developed in an orderly and progressive manner? Has it been made teachable?

Is the treatment of college grade? It is necessary to recognize what subjects the students who use the book will have mastered before taking up the subject under consideration. The time that may ordinarily be given to the subject also enters into the question. Many admirable books have had to be omitted because they included much matter that the college student has already acquired in other subjects and have failed to present exhaustively the subject on which the book is supposed to treat. A few books have been placed among the references rather than among the text-books, because the time required to master the contents would be too great for any except advanced students.

The committee has not been able, however, to set a standard to which they could adhere strictly. On one subject there might be five satisfactory text-books, only two of which would be selected while in another case there

might be only two text-books extant, neither of which came up to the committee's idea of what a college text-book should be, but yet the committee felt constrained to name them as the best that could be suggested under the circumstances. In most instances, where two or more text-books are mentioned, they are intended as alternates, but, in some cases, they are intended to supplement one another.

The reader should note that this is not an attempt to furnish a bibliography of the subject. It is merely a list of copyrighted books. Much of the most important literature on subjects relating to agriculture are to be found in magazines, bulletins and reports. Much of this material has not yet been put into copyrighted books. The committee has also been compelled to omit a number of useful books because they are now out of print, the purpose being to present only available literature.

NOTE — Reference numeral indicates publisher.
See following list.

AGRICULTURAL CHEMISTRY

Text Books

Richmond: Dairy Chemistry²⁶, \$4.
Snyder: Chemistry of Plant and Animal Life (elementary)²⁸, \$1.25.

Manuals

Hopkins and Pettit: Laboratory Manual for Soil Fertility², \$30.

References

Aikman: Manures and the Principles of Manuring⁴, \$2.50.
Johnson: How Crops Grow; How Crops Feed³³, \$1.25 each.
Storer: Agriculture in Some of its Relations with Chemistry⁴⁰, \$4.50.
Voorhees: Fertilizers²⁸, \$1.
Wiley: Principles and Practice of Agricultural Chemical Analysis⁸, \$4.

SOILS

Text Books

Hall: The Soil¹⁵, \$1.25.
King: Physics of Agriculture (first ten chapters)⁹, \$1.75.
Snyder: Soils and Fertilizers⁸, \$1.50.

Manuals

Mosier: Laboratory Manual for Soil Physics⁹, \$2.5.

Stevenson-Schaub: Soil Physics Laboratory Guide³³, \$50.

References

Conn: Agricultural Bacteriology⁵, \$2.50.
Hilgard: Soils²⁸, \$4.
Merrill: Rocks and Rock Weathering and Soils²⁸, \$4.
Roberts: Fertility of the Land²⁸, \$1.25.
Warington: Physical Properties of the Soil³⁴, \$1.50.

RURAL ENGINEERING

Text Books

King: Physics of Agriculture (Chaps. XI-XXIII)⁹, \$1.75.

Manuals: None.

References

Coleman: Stable Sanitation and Construction⁴², \$2.40.
Elliot: Engineering for Land Drainage⁴⁶, \$1.50.
King: Irrigation and Drainage²⁸, \$1.50.
Newell: Irrigation in the United States¹¹, \$2.
Roberts: The Farmstead²⁸, \$1.25.

Stone : New Roads and Road Laws in the U. S.⁴⁵, \$1.

FARM CROPS

Text Books

Fraser : The Potato³³, \$ 75.

Hunt : Cereals in America³³, \$1.75.

Forage and Fiber Crops in America³³, \$1.75.

Manuals

Lyon and Montgomery : Judging and Grading Grains¹⁷, \$ 75.

Shamel : Manual of Corn Judging³³, \$.50.

Ward : Handbook for Grasses in Field and Laboratory⁶.

References

Beal : Grasses of North America, 2 vols.²¹, \$7.50.

Burkett and Poe : Cotton (Culture, production, marketing)¹³, \$2.

Coburn : The Book of Alfalfa³³, \$2.

Killebrew and Myrick : Tobacco Culture³³, \$ 25.

Matthews : The Textile Fibres (Physiology, histology, chemistry)⁴⁶, \$3 50.

Shaw : Clovers and How to Grow Them³³, \$1.

Soiling Crops and the Silo³³, \$1.50.

Spillman : Farm Grasses³³, \$1.

Stebler & Schröter : The Best Forage Plants³¹, \$3.

Tompkins : Cotton and Cotton Oil (manufacture)⁹, \$7.50.

Zipser : Textile Raw Materials and their Conversion into Yarns (Physiology and technology)³⁹, \$4.

POMOLOGY

Text Books

Bailey : The Principles of Fruit Growing²⁸, \$1 25.

Pruning Book²⁸, \$1.50.

Nursery Book²⁸, \$1.

Manuals : None.

References

Card : Bush Fruits²⁸, \$1.50.

Hume : Citrus Fruits and Their Culture¹⁴, \$2.50.

Thomas, J. J. : The Fruit Culturist³³, \$2.50.

Wagh : Plums and Plum Culture³³, \$1.50.

Systematic Pomology³³, \$1.00.

Wickson : California Fruits³³, \$2.50.

OLERICULTURE

Text Books

Bailey : Principles of Vegetable Gardening²⁸, \$1.25.

Green : Vegetable Gardening³³, \$1.25.

Manuals : None.

References

Henderson : Gardening for Profit³², \$1.50.

Vilmorin, Andrieux : The Vegetable Garden¹³, \$4 50.

FLORICULTURE

Text Books : None.

Manuals : None.

References

Bailey : The Forcing Book²⁸, \$1.

Elwanger : Rose Culture³³, \$1.25.

Galloway : Violet Culture³³, \$1.50.

Taft : Greenhouse Construction³³, \$1.50.

Greenhouse Management³³, \$1.50.

Ward : The American Carnation¹³, \$3 50.

PLANT BREEDING

Text Books

Bailey : Plant Breeding²⁸, \$1.25.

Manuals : None.

References

Bailey : The Survival of the Unlike³⁸, \$2.

Bateson : Mendel's Principles of Heredity²⁸, \$1.30.

Darwin : Variation of Plants and Animals under Domestication³³, \$5.

De Vries, Hugo : Species and Varieties, Their Origin by Mutation³², \$5.

LANDSCAPE GARDENING

Text Books

Eliot, Charles : Landscape Architect²², \$3.50.

Kemp : Landscape Gardening⁴⁶, \$2.50.

Manuals : None.

References

Bailey : Garden Making²⁸, \$1.

Lowell : American Gardens³³, \$7. 50.

Nichols : English Pleasure Gardens, \$4.

Parsons : Landscape Gardening³³, \$3.50

Platt : Italian Gardens¹⁹, \$5.

Triggs : Formal Gardens in England and Scotland⁴⁹, \$25.

Van Rensselaer : Art Out-of-Doors⁴⁹, \$1.50.

PHYSIOLOGY AND PATHOLOGY OF
PLANTS*Text Books*Green: An Introduction to Vegetable Physiology⁹, 10s, 6d.McDougal: Practical Text Book of Plant Physiology²⁷, \$3.Massee: A Text Book of Plant Diseases²⁸, \$1.60.*Manuals*Ganong: Laboratory Course in Plant Physiology²¹, \$1.McDougal: Experimental Plant Physiology²¹, \$1.Osterhout: Experiments with Plants (elementary)²⁸, \$1.25.*References*Lodeman: The Spraying of Plants²⁸, \$1.Smith: Bacteria in Relation to Plant Diseases⁷.Tubef-Smith: Diseases of Plants²⁷, \$6.50.Ward: Diseases in Plants²⁸, \$1.60.Weed: Fungi and Fungicides³³, \$1.

ECONOMIC ENTOMOLOGY

*Text Books*Comstock: Manual for the Study of Insects⁹, \$3.75.Smith: Economic Entomology²⁸, \$2.50*Manuals*: None.*References*Comstock and Kellogg: Elements of Insect Anatomy⁹, \$1.Folson: Entomology with Reference to its Biological and Economic Aspects⁵, \$3.Howard: Insect Book¹³, \$3.Kellogg: American Insects²¹, \$5.Lodeman: The Spraying of Plants²⁸, \$1.Ormerod: Manual of Injurious Insects and Methods of Prevention⁴, 5s.Sanderson: Insects Injurious to Staple Crops⁴⁶, \$1.50.Saunders: Insects Injurious to Fruits²⁸, \$2.Weed: Insects and Insecticides³³, \$1.50.

ANIMAL BREEDING

*Text Books*Davenport: Principles of Breeding (in press)¹⁷.*Manuals*: None.*References*Darwin: Animals and Plants Under Domestication³³, \$5.Galton: Hereditary Genius², \$2.Morgan: Experimental Zoology²⁸, \$2.75.Sanders: Horse Breeding³⁷, \$1.50.Shaw: Animal Breeding³³, \$1.50.Warfield: Cattle Breeding³³, \$2.BREEDS AND MANAGEMENT OF LIVE
STOCK*Text Books*Plumb: Types and Breeds of Farm Animals¹⁷, \$2.*Manuals*Craig: Judging Live Stock²⁴, \$1.50.*References*Goubaux & Barrier: The Exterior of of the Horse²⁶, \$3.Hayes: Illustrated Horse Breaking⁴⁰, \$5.Houghton: Holstein-Friesian Cattle²⁰, \$1.Roberts: The Horse²⁸, \$1.25.Sanders: Shorthorn Cattle³⁷, \$2.Shaler: Domesticated Animals¹⁰, \$2.50.Wallace: Farm Live Stock of Great Britain¹⁰, \$3.

STOCK FEEDING

*Text Books*Henry: Feeds and Feeding², \$2.Jordan: Feeding of Animals²⁸, \$1.25.*Manuals*: None.*References*Armsby: Principles of Animal Nutrition⁴⁶, \$4.00.Manual of Cattle Feeding⁴⁶, \$1.75.

POULTRY HUSBANDRY

Text Books

Robinson: Poultry Craft: What to do and How to do it.

First Lessons in Poultry Husbandry.

Second Lessons in Poultry Husbandry¹⁶, \$1.50 each.Watson: Farm Poultry²⁸, \$1.25.*Manuals*American Standard of Perfection¹, \$1.50.*References*Biggle: The Biggle Poultry Book⁴⁷, \$50.Collingwood: The Business Hen³⁶, 50c.Fiske: Poultry Feeding and Fattening³³, \$50.

Johnson & Brown (editors): The

Poultry Book, An Encyclopedia of Poultry¹³, \$12.50.

DAIRY MANUFACTURING

Text Books

Decker: Cheese Making⁹, \$1.75.
McKay and Larsen: Principles and Practice of Butter Making⁴⁶, \$1.50.
Wing: Milk and its Products²⁹, \$1.

Manuals

Farrington and Wolf: Testing Milk and its Products²⁹, \$1.
Monrad: A B C in Cheese Making. A B C in Butter Making, \$.50 each.
VanSlyke: Modern Methods of Testing Milk and its Products³³, \$.75.

References

Aikman: Milk, its Nature and Composition³, \$1.25.
Fleischmann: The Book of the Dairy (translated by G. M. Aikman and R. P. Wright)¹, \$4.
Grottenfelt: The Principles of Modern Dairy Practice (translated by F. W. Woll)⁴⁶, \$2.
Gurler: American Dairying³⁷, \$1.
Michaels, John: Creamery Butter Making⁹, \$1.

DAIRY SANITATION AND BACTERIOLOGY

Text Books

Conn: Bacteria in Milk and its Products⁵, \$1.25.
Russell: Outlines of Dairy Bacteriology⁹, \$1.

Manuals

No manual for pure dairy bacteriology.
Frost: A Laboratory Guide in Elementary Bacteriology²⁸, \$1.60.
Gorham: A Laboratory Course in Bacteriology³⁸, \$1.25.

References

Abbot: The Principles of Bacteriology²³, \$2.75.
Belcher: Clean Milk,¹⁸, \$1.
Chester: A Manual of Determinative Bacteriology²⁸, \$2.60.
Swithinbank & Newman: Bacteriology of Milk³⁰, \$6.

VETERINARY MEDICINE

Text Books

Law: The Farmer's Veterinary Adviser⁹, \$3.
Reynolds: Veterinary Studies for Agricultural Students (elementary)\$2.

Manuals: None.

References

Mayo: The Care of Animals²⁸, \$1.25.
Smith: A Manual of Veterinary Hygiene²⁸, \$2.
Sriedberger & Fröher: Text Book of Veterinary Medicine²³, \$10.

AGRICULTURAL ECONOMICS AND FARM MANAGEMENT

Text Books

Card: Farm Management¹³, \$2.
Roberts: Farmer's Business Handbook (For farm accounts)²⁸, \$1.
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THE WORKER

A WALKING SUMMER SCHOOL OF AGRICULTURE

By H. S. Ogden, '06

(CONTINUED)

MULLICA HILL in southern New Jersey, is the shipping center of an active potato growing district. At Mullica Hill on the 24th day of July, the white potato harvest had begun and before this vegetable all other human interests seemed of minor importance. Heavy wagons loaded to their fullest capacity were laboriously hauled by trios of mules, or strong horses, to empty cars waiting to hurry potatoes to the clamoring markets of Philadelphia. On fences, houses or trees brilliant advertisements set forth the advantages of certain potato fertilizers or machinery. Mullica Hill was very busy and a trucking center in a rush season is a sight well worth seeing. For me, this hum and industry meant work and more experience. I was glad since I just hailed from a neighboring county in southern New Jersey, where the

demand for labor was low and my efforts futile, also my money was exhausted. Here the prospects seemed excellent. The first unoccupied man of whom I inquired, pointed to an empty potato wagon coming toward us drawn by three mules. The wagon, my informant said, belonged to "one of our most progressive farmers;" the driver would give me a lift to his farm where I could undoubtedly get a job at potato picking. He added that the farmer had hired some Italians a few days previously and was still looking for help. This sounded interesting as well as encouraging. I hailed the wagon which had now reached us, climbed to a seat beside the driver and was soon en route.

A mile and a quarter out of the village we arrived at a white house, large and prosperous looking, set

back from the road. That air of ruin and neglect, which brooded over many of the places I visited, had not entered here. Things did, in fact, look "progressive."

At a sign from the foreman I climbed down, while he volunteered to tell the "old man" of my arrival. The "old man" was then directing some negroes in the farm court yard.



MR. OGDEN AS HE STARTED FROM ITHACA

He was six feet tall and over and carried himself erect. His stern countenance suited his voice which was penetrating—it cracked and snapped like a whip. From the alacrity with which the negroes jumped to obey his orders, I could see evidence of a lively respect, not to say fear.

While I belonged to the dominant race and was a college graduate to boot, nevertheless, I drew near to the "old man" with sundry misgivings. He favored me, my kodak and diminutive suit-case with a quick glance of

curiosity. (At this stage on my travels I had grown accustomed to curiosity and indeed expected it.) He asked in curt, short sentences who I was, what I was, and where I came from. It was necessary to account somehow for the kodak, so I replied truthfully that I was a student from an agricultural college in quest of practical agricultural experience. My answer must have stirred his sense of humor, for he gave vent to a subterranean chuckle, and replied that he would try hard to make my "visit," as he termed it, quite practical.

"I start my men in," he continued, "at a dollar a day and board. If they are worth any more than that—they get it." And from the peculiar emphasis he placed on these last three words, I divined that while he might prove a hard master he was certainly a "square" one.

So it came about that I entered the service of the "progressive farmer."

The following morning, while still dark, some one called my name. I saw by my watch it was quarter after four! At the barn I found busy men; some cleaning the numerous stalls, others feeding horses and mules and the rest putting on the harnesses. At this last task I assisted, selecting, with a discretion gleaned from past experience, a certain white mule which looked fairly docile.

The chores over we adjourned to a hurried breakfast. Six o'clock found us out on the potato fields.

Our work was picking potatoes, which had been first raked to the surface of the ground by a two-horse "digger." It performed rapid and efficient work, though one might have assumed the opposite from the conduct of its driver, a red-headed Irishman, who maintained a continuous and vivid stream of profanity at the horses, the stony ground or the machine itself.

We, the "potato pickers," followed the "digger," each of us picking two rows, a row with each hand and throwing the potatoes into peach baskets. The potatoes were sorted into two classes. With the good-

sized ones, which included the vast majority of the crop called "firsts," we filled our baskets, while the remaining ones known as "seconds" or "culls," were merely placed in piles to be gathered later. In picking we knelt or stooped, pushing, sliding and lifting the basket before us and, let it be known, that a five eighths bushel basket filled, or nearly filled, with potatoes is no merry jest. It was painful also kneeling on earth liberally sprinkled with the sharp-edged stones turned up by the "digger." For my companions, who had been picking potatoes since the beginning of the harvest, nature had kindly developed callosities, but pitching hay had not provided any such protection for my shins. It was not until the beginning of my second week as a potato picker, that I became adapted to the work and could follow the occupation with tolerable comfort. But through all the incident aches and pains dominated one idea—I must keep up with the pace set by the "gang." Our employer well understood how to use to his advantage the sense of rivalry, for he always started the men together at one end of the field. It proved very humiliating when I had fallen behind, to have the swiftest picker detailed from his row to bring me even. Still the competition, a heavy strain on a beginner like myself, was a blessing in disguise. It brought some human interest into what would otherwise have been eleven hours of the hardest drudgery.

The competition and interest in the personalities of the men with whom I toiled, made the day tolerable. The gang presented variety both of race and nationality. The Irishman, who ran the potato digger, has already been mentioned. Also the foreman who helped in the picking when not hauling loads to Mullica Hill. Besides these were an Italian, his boy and three negroes. Nor should I leave out "Jim" with whom I shared a cabin. "Jim" was a small man with a melancholy expression and endowed with a humorous vein, and

a manner of speech which could make one laugh even when exhausted. He was a respectable tramp, if this is not a paradox, for he confessed that he was only happy when "on the road." He had travelled throughout the United States, making his way by mechanical work such as sharpening lawnmowers, etc. Sad to relate an untrustworthy partner had recently absconded with his tool kit (valued at \$10.00) and left him stranded. I found him an interesting narrator educated by travel above his financial and social status.

With our Italian I was soon on friendly terms, having picked up sufficient Italian during a summer in Italy to converse with him a little. Our friendship might have prospered better had he not persisted in incessantly smoking a tobacco possessed of a peculiarly suffocating and villainous odor. His companionship was only desirable when my rows lay well to windward, a strategic position for which I carefully maneuvered.

The negroes at first caused me some apprehension. Having lived several years in Maryland and Virginia I was fairly familiar with the characteristics of the race, but had never hitherto associated with them on terms so closely approaching equality. Circumstances would not permit of a rigid dignity. I resolved to be sociable and friendly yet maintaining a certain reserve. My apprehensions were fortunately groundless for no difficulty arose. Indeed, not infrequently I found more congenial the light-hearted talk of the black than that of the white men, who grumbled more or less continuously at all inconveniences from the sharp stones, beneath us, to the scorching sun above.

On my part I was watchful of any opportunity to raise my standing among the men. To illustrate by a specific example: One evening one of the negroes came to my cabin ostensibly to borrow my writing materials but, as I easily divined, really for some one to write a letter to his family down in southern Virginia, a

task to which he was unequal. We composed the letter together and so not only gained his friendship but his respect for a superior education, and thereafter he addressed me as "Boss."

It appeared more necessary to be careful of one's position among the white members than the black. Forbearance is a virtue not appreciated among certain classes. It passes for weakness.

It was cool at the start but as the sun mounted the heat became tropic and several of us observed that phenomena accompanying excessive heat, namely, the quivering appearance of the landscape. The hours seemed interminable. Thinking surely it must be approaching noon I glanced at my watch to find it indicated only half past nine.

After the lapse of a second geological period noon finally arrived. We climbed into the wagon and drove home to a most excellently prepared meal, far better than I had anticipated. Quite interesting from a social point of view was the seating of the men. The negroes, of course, had a separate dining room. Into this I wandered by mistake but fortunately discovered the error. The two Italians ate in their shanty. The Irishman was a tenant of his employer and dined with his family in a neat rented cottage. The foreman "Jim" and I, being formally acknowledged the social equals of the boss, ate with him in the family dining room. Occasionally the family, well dressed and cultured, joined us and at such times the atmosphere was decidedly strained. I felt profoundly uncomfortable and painfully aware of my rough appearance. I dared only make known my wants and sometimes left these unsatisfied, rather than open my mouth to speak. I think I but shared the feelings of the other men. At the table their elaborate courtesy and politeness was intensely amusing when contrasted with their free, easy, not to say, violent speech out on the more democratic fields.

Dinner over the usual rural rest

after a hearty meal was dispensed with. The horses were "geared" and out we drove once more to those sizzling, broiling fields. The afternoon's work was but a repetition of the morning's, with the same slow lapse of time and the same effort to work at high pressure, for we were employed by one skilled in working men to the limit of their strength. He had to get his potatoes to market while present high prices maintained. So the "old man" was ever among us and not slow to empty the vials of wrath for a slight oversight. His anger fell in its full force only on the negroes and Italians. They were the only ones who would, pardon the slang, "stand for it." Toward the rest he was more moderate. But the sharp tones and aggressive demeanor was a strain as well as an incentive to all. To me he was kindly, usually spoke in a gentle tone and was considerate when I made mistakes.

Not long after when leaving the section, a chance conversation with a neighboring truck farmer gave me the employers' point of view. He said speaking of potato work:

"To boss a gang of men is the hardest job on God's green earth. I would a deal rather do the hardest kind of picking myself. In the busy season I employ about twenty men. Suppose this whole gang stands up to 'rubber' three minutes, there I am out of the work that one man could do in an hour. I can't afford to lose that hour."

Every day's work has its end and ours came, though tardily, at half-past six. Once more we climbed into the wagons and were driven home.

Supper was a more leisurely meal than dinner. After it was over the men sat in groups in front of their cabins smoking and talking in the dusk. What they said was interesting, but I longed to be alone—for solitude in which to recover from the unusual and somewhat trying conditions of the day's work. My sensibilities were cut and raw. It was necessary to adjust myself to this new situation.

So I left the men and strolled alone to an old apple orchard some distance away. I sat down under a spreading tree and lit my pipe. Through good fortune I had happened on a knoll commanding the east. I saw the yellow New Jersey moon rise slowly from the horizon to shed on the quiet

landscape a wierd and mellow light. The evening breeze was cool and soothing. It fanned away the day's work, its hurry, heat and effort. Instead was ushered in a grateful sense of deep physical and mental rest.

Life was worth living even on a potato truck in its rush season.

(To be continued)

MAKING GOOD ON THE FARM—II

By Louis A. Ripley, W. '05

Kilravock Farm, Litchfield, Conn.

MY farm is situated in the north-western part of Connecticut, eleven hundred feet above sea level. The farm contains three hundred acres, about seventy of which are in woodland, eighty acres pasture-land and one hundred and fifty acres are tillable. Rocks are more than plentiful. In fact there are many pastures nearby, where one can walk from one end to the other, without stepping on sod. Another disadvantage is that the season for farming is so short. Frosts come early and stay late.

When I entered the short course at Cornell, directly from the real estate business in New York City, I knew as little about farming as the average

business man, and I am willing to confess that I know very little about it now, especially the scientific part. I left Cornell in March convinced that farming was a scientific game far too deep for me, but nevertheless resolved to try to make my three hundred acres yield as large a return as possible, no matter what method I should deem necessary to employ.

I saw a large fortune ahead in twenty acres of potatoes, so immediately started to plow and harrow twenty acres of sod land. One of the fields was a perfectly level ten acre strip, and, later on, it certainly made my heart glad to see that beautiful mass of green mountains in full blossom. Well, I kept the spraying ma-



HARVESTING CORN

chine pumping Bordeaux and Paris Green all summer, and when it was not busy the cultivator was. I don't know what the neighbors thought, but they were kind enough not to express their views within hearing distance. I kept a strict tally of every minute's labor expended. My profit on the twenty acres did not amount to more than one hundred dollars. I figured one man and team at 40 cents per hour. Nevertheless, I feel convinced that the potato crop is one of our best, but in my case it would have been better to have experimented on a few acres before attempting twenty.



HARVESTING OATS

I sowed fifteen acres to oats and was more pleased with it than with any other crop. Five acres were sown to oats purchased from Mr. Harry B. Winters, and they were highly praised by everyone, and many considered them to be the finest oats they had ever seen. I found that this crop of oats paid me better than any of the other crops, supplying as it did ample feed and bedding for my horses. After purchasing a reaper, I discovered that it was very much cheaper to cut the oats with a mower, as they could be thrashed just as well loose, and it saved the expense of binding. One of the oat fields was full of wild mustard, so as directed at Cornell, we sprayed most successfully with copper sulphate.

With my corn crop I made a mistake in planting Long's Champion Yellow Dent. I planted it four feet apart in hills and cultivated it both ways all summer. It grew very high, but did not fully mature. For the

silo I made the mistake of planting a flint instead of a dent variety. For grain I find that the farmers around plant early Canadian corn.

At last I became convinced that I must make a specialty of something, so decided to raise White Leghorns for egg production, and was very fortunate in securing the services of an experienced poultryman. We built twenty-four brooder houses, similar to those used by Messrs. White & Rice, which are heated by gasoline. These worked very satisfactorily, and had the great advantage of being large enough to accommodate one hundred and fifty chicks. We then decided to have twenty laying houses built on the eastern slope of a long hill, and a short time afterwards built ten more. The illustration shows some of these better than I can describe them. The slope of the hill made it possible to arrange a scratching place under the floor of each house. Two windows and a door were cut on the south side of the building to let in all the sunlight possible, also one window on the east. Most of the houses are yarded now, so that the pullets can have free



PLANTING POTATOES

range during the summer season, and closer confinement at other times. A three-quarter inch pipe, laid in a furrow, is the means of supplying water to the water basins outside of the houses. Owing to the slope of the land, the pipe can easily be drained, but in exceptionally cold weather we carry our water. I now have eighteen hundred pullets, having had good results last spring from the incubators.



A GROUP OF COLONY HOUSES

These pullets are all in fine condition and are laying well.

Last spring I secured the services of an experienced farmer, and with his help we planted one thousand apple trees. The varieties were Greenings, Baldwins and Kings. We also put in sixteen thousand currant bushes, among some of the apple trees. Next spring we expect to plant one thousand more standard apple trees and eight thousand dwarf apple

trees. Apple trees do very well all through this section, and I feel sure if properly cared for should bring in as good a return, if not better, than any other crop can in this part of the country.

With close attention to business and with the great help which I expect to obtain from the Agricultural College and Experiment Stations, I feel sure that these enterprises will be successful.



AGRICULTURE OF OTHER NATIONS—V POLAND

By Boza M. Kleniewska, '07



HOEING SUGAR BEETS

PERHAPS the poorest American farmers will have to consider themselves well off in comparison with those of European countries. The chief food of an average Polish peasant is potatoes and black bread, seldom milk, and perhaps twice a year, at Christmas and Easter, meat; therefore the endurance of a Polish workman cannot compare favorably with an American or even with the Germans or Dutch. Still we can say that a Polish peasant works wonderfully in consideration of his nourishment.

Children on the farm are put to hard labor quite early. Boys take care of stock in the pastures, as there are not any fences as in this country, and girls are sent at some kind of work in the field as, weeding, picking up stones from plowed fields, and taking care of babies whose mothers are working. Married women have to do the field work during the sowing and harvesting seasons, in places where sowing is done by hand and harvesting with sickles or scythes. On larger farms there is a common custom to hire soldiers for the harvest, when harvesting machines are present they do the binding, as binders do not yet pay there. A soldier is paid better than average workmen. The latter

gets 15 to 20 cents a day, while the customary soldier's wage is 25 cents.

The money which the soldiers earn is given to the government, and the men get only a small per cent of what they have earned. The workingmen on the farm do not own their homes, but are given a room or two (per man and his family) by the one who employs them. Such houses are usually built to contain four families. To the house belongs also a pigpen and chicken coop. The cows for the help have to be all kept in a general barn. A man is never allowed to keep more than two cows. The landowner hires a man to take care of the cows of the help and milking is done by women who own them.

A man on the farm is paid by the year, his salary is very small, it runs from \$20 to \$50 per year. In addition to the pay he gets grain and potatoes, or more strictly speaking, just the ground for potatoes, because he has to do the planting and digging himself.

A landowner of more than one thousand acres, usually has his own flour mill on the farm, and the help have their flour ground there free of charge. At the present standard of living the demands of our peasants are extremely small. Almost the only ar-

ticle of food they purchase is the salt. The lard is obtained when they occasionally slaughter one of their pigs. They have not enough milk to make butter so they do without it. They plant their vegetables in the small gardens in front of the houses.

The time is passing when our peasants made their own linen or woolen goods. It is cheaper for them to buy cotton goods, and only a few districts still retain the real national garments, made of durable, hand woven materials. The contact with the cities, too, brings more and more the city style of dressing (the European style) into the country.

The working day on the farms is from sunrise to sunset, thus to sixteen hours in summer and eight or nine in the winter.

I have described the poorest class of Polish peasants; next above these come the small landowners. Some of them own not more than four to six acres of land, and they cannot think of supporting themselves and their families from this. The only way for them to exist is to earn some money outside of their farms during the winter months. They often work in factories or work with their teams in some lumber business.

We do not find any machinery on such small farms except the plow and the harrow in their crudest form. Everything else is done by hand, the



A NATIVE COSTUME

sickle and the scythe are used for harvesting and the flail for threshing. There are some of the more prosperous farmers owning more land, but they do not progress very much, using almost exclusively the methods of their ancestors. The reason for this is the lack of free agricultural colleges where the farmers' boys could be educated.

The distribution of land in our country is as yet extremely uneven. There are comparatively few men



A FARM HOUSE OF THE BETTER CLASS

that own ten to twenty thousand acres. Some of such estates are hereditary, descending from father to son as in England, and the rest of the farming territory is split into very small farms, remaining under quite primitive methods of cultivation.

Since about the last ten years the income from the land in our country has been greatly reduced. One of the causes was the great emigration of the working class to Germany and the United States. In some instances the conditions on larger estates became similar to those of the southern plantations. After the Civil War there was no one to cultivate the land. Many landowners became bankrupt and many, in order to prevent the evil, divided their land into shares and sold it to the smaller farmers to whom loans were given from the Agricultural Banks. This really should bring an even distribution of land property, and the lack of success in such cases is due to the fact that land goes from a more able management into hands of people who know little of progressive agriculture, which brings about the devastation of the land.

The only way to remedy the present evil would be to establish numerous agricultural schools where even the poor farmers could send their sons. Our people now more and more realize the great necessity of schools and the recent increase of these brings a beam of hope for a brighter future to our country.

A LAND-SEA ROTATION

By Harry H. Schutz, '07

RECEDING coast-lines and encroaching waves are not the only means by which the land may become creditor to the sea.

Torrential rains wash fertile soil into the sea; drainage waters charged with valuable plant food also take this course; and the sewage of but too many of our cities likewise goes to enrich the sea-water and bottom.

The mud-deposit of the Mississippi alone is more than 7,000,000,000 cubic feet each year, which does not include any of the millions of pounds of plant food that it carries in solution. When we consider rivers of even greater volume than the Mississippi and the numerous smaller streams flowing into the ocean, we are confronted with an almost inconceivable waste of soil-fertility. Over the greater part of this waste we have no control, but are we preserving what we can? The engineer and the agriculturalist will decide the problem for us some day.

Much of the sediment carried by the rivers is deposited in lakes or is made into deltas, but where tides exist it is carried farther out and finally finds its way to the great depths. The salts carried in solution by the streams are not so fortunate and almost all go to swell the sea's indebtedness to the land. We must not forget, however, that the salts and sediment serve indirectly to maintain life in the sea by providing nourishment for the water flora. Some of the lower forms of aquatic life feed upon vegetation, the higher forms feed upon the lower, and the salts and sediment that have poured into the ocean for thousands of years make their existence an easy one.

The practice that prevails in many places of making use of the products of the sea for fertilization of the land, though as yet of relatively small proportions, is one of great economic importance in that it enables us to retrieve some of our loss. We can return much of the lost plant food by extending the practice of irrigating from rivers and the use of such fertilizers as dried crab and fish, sea-bird guanos and sea-weed. It also lies within our power to prevent loss through the utilization of sewage and manure, and the protection of fertile lands against the ravaging action of floods and rains.

However, in the long run the earth must still continue to be impoverished by the sea, but with the increasing demand for artificial fertilizers will

come an era of land-sea rotation that will do much to prevent the exhaustion of our soils.

THE FARMERS' READING COURSE

By R. J. Shepard, '10

ONE of the greatest, if not the greatest, benefit that has ever come to the farmers of New York State, is the Cornell Reading Course. We all have to admit that farming is not what we might call an easy occupation, although it has its "rainy days." But the benefits and pleasures which a man attains, while going about his daily labors, more than repay him for his physical exertions. Is there not a vast difference between being shut up in an office, or store, with the smoke shutting out all the sunshine, and working in the open air, with the rippling of the brooks and the singing of birds for music? We are close to Nature, and if we understand the why and wherefore of some of Nature's important laws, we cannot find a more pleasant occupation.

Now, in many parts of the State during the winter months, small parties of farmers gather in one another's homes, to read over and study the bulletins that they receive from Cornell. I have in mind one in my own neighborhood. The Reading Club, as it is called, meets every week. One member is chosen a week, or perhaps two weeks ahead of time, as a leader. He reads over the bulletin and makes a study of it. When he comes before

the club he has a fair knowledge of the subject, and is usually able to answer a good share of the questions that the members ask. About two-thirds of the evening is devoted to the men and the remainder of the time is given over to their wives for special study along their line of work. Generally about two hours are devoted to study, and at the end of that time all papers are laid aside, and they have an hour of recreation. If the hostess is so disposed, she passes around fruit and popcorn, and while this is being eaten they listen to music and recitations by the children.

Within a radius of perhaps five miles of my place there were four clubs. So they met and organized a large central club. This would meet once a month, and it was the endeavor of the president to get some person to speak on some special subject. Last winter we had the pleasure of listening to Prof. Wing, Prof. Whetzel and Mr. Hosford, all from Cornell.

In order to get an idea of what these people think of the work, one must be with them for some time. I was speaking with one of them about it, and he said, "One day last summer I was plowing on my farm, and I stopped a few minutes to let the horses rest. I was sitting between the plowhandles and unconsciously I picked up a small grass root and began to examine it. You can't imagine of how much interest it was to me to pick out the different parts and to know what their functions were. Before last winter I knew nothing about it. If any person tells you that the Reading Courses do not amount to much, you just send them around to me."



The Cornell Countryman

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MAY, 1907

Yellow Agriculturism

THE country is rapidly recovering prestige and self-respect. During many years it has been apologizing for its existence and attempting to disguise its real self beneath an imitation manner and dress gleaned from the city. Now, however, when the country is beginning to be appreciated for its own value and not for the accuracy of its imitation of the towns, there most naturally arises an enormous mass of written and spoken evidence concerning the country as a place in which to earn a living. In this mass of material there are speeches that are hysterical, experimental results that are exaggerated, and books and magazines that radiate lies. The agriculture which is not practiced, but which is written and spoken, is not merely off color; it is yellow. In this the exceptional is made to be the average, and the impossible to be the reward of industry and thrift.

That such methods are not only unfair to the uninformed but disastrous to the initiated cannot be denied. The awakening of a countryward movement and the maintainance of a

profitable living for the farmer cannot be either aided or sustained when the quiet help of consistent schools, papers and experiment stations is drowned by the clatter of a thousand persistent men who grab for a very cheap fame.

Magazine articles which make it appear that farm land bought at fifty dollars can be made to produce a thousand dollars an acre by the aid of native intelligence and large assurance will disgust thinking people. Published experimental results which explain how to draw down unlimited nitrogen from the air by the careless inoculation of the soil, or how to gain a wonderful stock of seed corn by a single year's selection, are unfit for publication until substantiated by more careful results than many of the writers are able to show.

The country is not an El Dorado where, without farm experience, broken-down business men or uninitiated maiden ladies, can earn large sums by easy methods. It must be remembered that the American farmer has a farm of 146 acres from which he gets \$826. Of this he feeds \$170 worth to his livestock. This leaves him \$656, or \$4.47 per acre. But from this he pays out \$64 for labor, \$10 for fertilizers and has other expenses. These with the interest on his investment bring his total income from his own labor down to \$288 a year. When he raises wheat he gets 13 bushels per acre. His corn yield is 28 bushels. He has about four draught animals. On this farm he supports a family of five.

These figures do not belittle agriculture. They do glorify it. A pursuit that pays so little in cash must have other and more substantial returns which do not appear on the

pages of the census reports. The happiness of farm life must be sufficient to compensate and the psychic income of the economist prove a reality.

It is important that a speedy finish should be put upon the growing tendency which we have called "yellow agriculturism."

Environment LONELINESS is caused by a state of mind rather than by a condition of the environment. When

persons allege a dislike of the country because of its loneliness, they exhibit a common state of mind but do not necessarily have cause to blame the country environment.

Most city men state that their dislike of the country as a place to live is largely because of its loneliness. They would rather be where life is compact, where crowds are near, and where one is seldom alone. The city man says he is lonely in the country.

Many countrymen state that their dislike of the city is because of its crowded and over populated condition. They would rather be where the air and the sky are open and free, where natural objects are many, and where life is not so lonely. They say they never felt so much alone as in a great crowd where they knew no one. They would dislike to live where they didn't know their next-door neighbor or anyone in their vicinity. The countryman says he is lonely in the city.

Both the countryman in his city loneliness and the city man in his country loneliness are the victims of a state of mind for which the changed environment of neither is to blame. Both exhibit a lack of adaptability to

changed surroundings and a failure to appreciate the benefits of a condition to which they have not been accustomed.

The city man in the midst of an overpopulated district may find occupation and interest in the people and things about him. If that same man finds neither interest nor occupation in the life of a quiet countryside it is because his appreciation has not been developed in that direction. The probability is that the man never had a chance to stay in the country till he became accustomed to it.

If the countryman, who riding through a stretch of woods notes the trees, the birds, the flowers and in doing so finds a pleasure, has no interest in city life or city scenes it is because his interest and attention have never been developed in that direction. His powers of perception are not in sympathy with city scenes and life.

The man with the broadest sympathies is he who will receive the greatest pleasure. The one who can find interest in either country or city life will not be lonely in either environment.

Fresh Air FAR be it from us to question the wisdom of the State architects who designed the new buildings. Nevertheless, we have been guessing what the correct term might be by which to designate the masonry structures that tower in chimney-like effects above the roof.

These turrets cannot all be chimneys, for the buildings are heated from a central plant. It had been darkly hinted that the peculiar struc-

tures were ventilators. This is impossible, since, to any one attending classes, it has been apparent that no ventilative system was in successful operation. The only ventilation has been secured when windows were open. To our very limited knowledge, no "chimney-like effects" are necessary to accomplish ventilation of such character.

It has been said that the architects expected the outside air and the inside air to change places through the

chimney-like effects without any assistance. In other campus buildings it has been deemed necessary to use pumps as in the Library, Morse Hall and Goldwin Smith Hall.

Possibly the architects believed that an all-wise providence, recognizing the beneficent character of agriculture, would assist in this case and either work the so-called ventilators or sustain the students on carbon-dioxide.

We wish that we too possessed such sublime faith.

GENERAL AGRICULTURAL NEWS

A bill just passed by the late Congress provides that the land-grant colleges shall be designated as depositories for all public documents. Up to this time special application for the government publications were required but now all Government publications will be sent regularly when issued.

* * *

The report of the seventh annual conference of the Agricultural Societies of New Zealand contains the report of a special conference on rural education which was held at the same time. Resolutions were presented which urged that the training for agricultural pursuits should be begun in the primary schools as it is in the lower grades that the majority of the farmers receive their education.

Special training for the teachers was urged by means of short courses of instruction and the appointment of traveling instructors to give object lessons on school gardens and nature study.

The plan of centralizing the rural school into one central school and transporting the children there, as has been adopted in many rural districts was recommended. There is an economy in the matter of finance and in teaching power, the efficiency of

the teaching is better, the classification of the pupils is hastened and it is possible to have better and more completely equipped school-houses.

* * *

Word comes from Virginia that Prof. A. M. Soule who is the dean and director of the Virginia Polytechnic Institute at Blacksburg has recently resigned his position to accept a similar position in the Agricultural College of Georgia.

* * *

The question of removing the Connecticut Agricultural College from its present site at Storrs, Conn. to some place which shall be nearer to the center of population is being considered.

* * *

Massachusetts is coming to the fore in the matter of agricultural education as is shown by the announcement of a Teachers' Summer School in Agriculture which is to be held under the auspices of the Massachusetts Agricultural College at Amherst, Mass. Prof. F. A. Waugh is to act as dean of the school. This should supply the need of better agricultural training in the teaching of agriculture in the public schools.

CAMPUS NOTES

Professor H. J. Webber took up his duties as a member of the college faculty on April 1st. Dr. Webber comes to Cornell as Professor of Experimental Plant Biology and will thus organize a new department whose object will be to work along lines tending to throw better and further light on the laws of heredity together with the effect and influence of environment.



H. J. WEBBER

Professor Webber was born at Lawton, Michigan, in 1865, and graduated at the University of Nebraska, in 1889, receiving there, in 1890, the degree of M. A. In 1891, he was created a Doctor of Philosophy by Washington University. Professor Webber was trained primarily as a botanist and studied under Dr. C. E. Bessey whom Professor Webber believes to be the most inspiring teacher of botany in the world. Professor Webber's scientific reputation rests fundamentally upon the very remarkable results of his studies on the

"Fecundation of *Zamia*" which were published in the Botanical Gazette of 1897, and bulletins of the Bureau of Plant Industry. After three years as instructor at the University of Nebraska and Washington University, Professor Webber in 1892 went to Florida as investigator of orange diseases for the U. S. Department of Agriculture. There he remained five years. During these investigations two forms of fungi were found which were parasitic on the White Fly. The spread of these fungi has done more to keep the pest in control than any other treatment.

For the past ten years Professor Webber has been employed in the governmental plant breeding work at Washington. His work there has been extraordinarily successful in creating hardy oranges for growth north of the frost line. Of these citranges, or hardy oranges, there has been named eight varieties from one hybrid alone of the trifoliate and the common orange. These can be grown from 300-400 miles north of the present orange region, and are expected to form the foundation for a new class of fruits. The opposite cross of the orange with the trifoliate also proved an excellent one. These fruits are used primarily as ade fruits, as are the lemon and the lime. Another strange group of fruits has been formed between the tangerine and the "grape-fruit." These possess the "kid-glove" quality of the tangerine with the flavor of the grape-fruits. There were several new varieties of limes formed and two new tangerines of value. Pineapple hybridization resulted in the naming of fifteen varieties of superior qualities of flavor and vegetation. Professor Webber is widely known for his evolution of the Columbia variety of upland cotton with a fiber of $1\frac{3}{8}$ inches long which was secured by selection only from Russell Big-boll with a 1 inch fiber. Professor Webber has also accomplished the separation of cotton seed into light and heavy grades by a new method. The method and machine have been entered for patent. The

separation of seed by this method gave an increase in yield of ten per cent as an average of repeated tests.

This year at Cornell Professor Webber expects to begin work on four promising varieties of corn for New York State. He also expects to plant 1,200 oat hybrids and to carry on added investigations with forage plants.

* * *

Mr. John P. Stewart who has held the fellowship in Agriculture here, has been appointed Assistant Professor of Horticulture at the Pennsylvania State College. He began his work there April 1. He is to undertake investigations into the causes affecting the yield and quality of apples.

* * *

Professor Warren has lately been arranging for some extensive investigational work in southern New York and the southern part of Tompkins County. Of late clover has failed to grow where formerly it did well, and the experiments are to take up this question and discover, if possible, the cause of the decreased production.

* * *

On April 2 and for several days following, considerable inconvenience was experienced in the Dairy Building because of the bursting of the five inch steam main supplying it. The remainder of the buildings were unaffected, but the combined lack of steam and sudden cold weather led Professors Pearson, Wing and Rice to curtail their office hours and seek more congenial locations.

* * *

The following students acted as assistants in the Winter Poultry Course the past winter, being virtually Instructors in various branches: W. C. Knapp, Sp., A. C. Spencer, Sp., H. H. Schutz, '07, and Miss Clara Nixon, Sp.

* * *

The Dairy Department has just arranged to operate two additional creameries situated at North Lansing

and Howlands respectively. This provision is being made in order that milk supply will be sufficient to be depended upon for the Winter Course students.

* * *

The outlook for this year's baseball team is, from present indications, comparatively good. Five of the members of last year's team are still here and a large number of new men who promise various amount of ability have signified their intention of playing.

* * *

The Rural Engineering Department is in receipt of a threshing outfit which arrived April 4. This consists of a complete small-type threshing machine and traction engine and has been sent to the College by the J. I. Case Company of Racine, Wis., through their general distributing office at Syracuse. The engine is of 9 H. P. and the outfit though not the largest size made is complete in all respects. It has been sent for purposes of teaching and demonstration and will enable students to become familiar with the more complex types of farm machinery.

Other implements of various kinds have been promised by different manufacturing firms, one of the most interesting of which is a rice- and coffee-huller lent by the Englewood Huller Company of Syracuse. This will be of interest to the students taking the Tropical Agriculture courses, particularly as specimens of the raw materials are being procured through the influence of the company and the actual hulling processes will be shown.

* * *

During the Easter Vacation, Dean Bailey spoke in Rhode Island, before the Rhode Island League of Societies for Rural Progress.

At present Dean Bailey has under consideration methods for the protection of the new buildings from the danger of fires. The College has supplied the buildings with several hundred feet of hose at various points,

and a hose-cart and outfit similar to the one now on Cornell Heights has been purchased. This will probably be installed in the basement of the Agronomy wing, and a volunteer company formed of the employees throughout the building. At present there are about nine janitors, engineers, etc., and as the buildings are completed more will be needed. Some additional scheme for night protection will be devised so that safety from fire will be assured.

* * *

The Assembly was held on the evening of April 4th. It was begun with two piano solos by H. F. Major '07. The remainder of the program was given to Dean Bailey's address in which he first outlined the plans for the Centennial and Dedication celebrations, then spoke about the Round-Up Club—which was the name chosen for the new Animal Husbandry organization. He emphasized the need and usefulness of such clubs as this and the Lazy Club for maintaining the social unity of our rapidly growing college. He suggested an occasional general meeting in which all the clubs could participate and which would still further draw the college together. Dean Bailey mentioned the Traveling Summer School of Agriculture which is now an established course to be given each year providing a sufficiently large number of students elected it. In closing, Dean Bailey spoke of the arrival of Dr. Webber as head of a new department—one which has been "made for the man rather than the man procured for the department."

The hostesses for the evening were Mesdames Slingerland, Crosby, Hunn and McGillivray, assisted by a committee of Messrs. Toan, Willard and Wood.

FORMER STUDENTS

'80, B. Agr. — William Arnon Henry was born at Norwalk, Huron county, Ohio, June 16, 1850. His early life was spent in the country. He attended the Ohio Wesleyan Uni-

versity, Delaware, Ohio, and was Principal of the New Haven, Indiana, High School for two years, and of the Boulder, Colorado, High School, three years.

In 1876, he entered Cornell University, remaining four years, graduating in June, 1880, with the degree of Bachelor of Agriculture.

As a student he roomed in White Hall with Prof. Wing. At that time only the first floor was used for class room purposes, only four hundred students being in attendance. The



W. A. HENRY

upper stories were used for dormitories. While in college Dean Henry was prominent in student activities, being president of his freshman class, and was chairman of the class day exercises in his senior year.

While at Cornell he served as student instructor in botany and during the summer of 1879 was with Prof. C. V. Riley on the United States Entomological Commission, Washington, D. C.

In June, 1880, he was elected Professor of Botany and Agriculture, at the University of Wisconsin, Madison.

In 1883, Governor Rusk in his message recommended the establishment of an experiment station at the University, which was created the same year by the Regents. In 1883, his title was made Professor of Agriculture.

In 1887 the Hatch Act was passed by Congress, whereby the general government granted \$15,000 annually to each state for agricultural research. Prof. Henry was appointed Director of the Experiment Station that year.

In 1891 he was appointed Dean of the College of Agriculture, his title being "Dean of the College of Agriculture and Director of the Agricultural Experiment Station; Professor of Agriculture."

Under his directorship there have been published to Feb. 1907, 23 annual reports of the Agricultural Experiment Station, of not less than 15,000 copies each, aggregating 6605 pages of printed matter, and 145 bulletins, in editions of from five to fifty thousand copies, aggregating 4415 printed pages.

In 1891 he prepared Part II, entitled "The Feeding of Cattle," of Secretary Rusk's famous book, "The Diseases of Cattle and Cattle Feeding."

In 1895, with his associates, Prof. Henry prepared "Northern Wisconsin; A Handbook for the Homeseeker," a volume of 200 pages, with numerous illustrations. The edition numbered 50,000 copies.

In 1898 he published "Feeds and Feeding; A Handbook for the Student and Stockman," a volume of 770 pages.

For years he served on the editorial staff of the *Breeders' Gazette*, Chicago, and was the founder of the "Feeders' Corner" in that paper. He likewise served for many years on the editorial staff of *Hoard's Dairyman*, Ft. Atkinson.

In June, 1904, he was granted the degree "Doctor of Agriculture" by the University of Illinois, and in July, 1904, the degree "Doctor of Science" by the University of Vermont, at its centennial celebration. He was

married July 11, 1881, to Clara Roxana Taylor, of Oakfield, New York. His wife died at the Dean's House, Madison, July 5, 1904.

When Dean Henry took charge of the Agricultural College in 1880, there were no agricultural students in attendance. In the fall of 1885 there was issued a circular, announcing "The new course in agriculture at the State University." This is now known as the Short Course. It began January 7, 1886, with an attendance of 19 students. This was the first modern agricultural short course successfully established in this country.

In 1890 the first dairy course in America was established, with two students.

In 1904 the Farmers' Course was established, with a registration of 175 members.

During his administration the University farm has been increased by about 300 acres.

When Prof. Henry took charge, there was a small farm house, two very ordinary barns, a little live stock, a few tools, and a few armfuls of books on agriculture. The present buildings of the College of Agriculture represent an expenditure of about \$400,000 and the personal property of the College aggregates nearly \$150,000 in value. The live stock inventories over \$20,000.

He has always given the College library first attention and care. It now numbers over 8000 bound volumes, all on agriculture, and is without an equal in the west.

In the early years, Prof. Henry personally carried on much research work. Because of increased executive duties, he has undertaken but little research work in later years. On account of ill health he has resigned after 27 years of active work. The trustees have voted him as Professor Emeritus of Agriculture.

'01, W.—E. C. Bradley is farming at Parma, Idaho, and likes the West.

'03, B. S. A.—E. J. Glasson is a special agent of the Bureau of Plant

Industry at Washington. Mr. Glas-son's territory is in the South, rang-ing from Georgia and Florida to Rocky Ford, Colo. He is gathering agri-cultural statistics particularly applied to truck crops.

'04, B. S. A.—H. E. Kinne is herdsman for H. L. Bronson, the dairy expert at Cortland, N. Y.

'04, W.—D. H. Cole is at Berkeley, Cal. and is engaging in the dairy business. He recommends California to the students as a place offering many opportunities.

'04, B. S. A.—C. W. Howard has been appointed Acting Entomologist of the Transvaal to succeed the late C. B. Simpson. Mr. Howard had been assistant to Dr. Simpson.

'04-'06, Sp.—Ernest Kelly is suc-cessful as sanitary expert of the Fair-field Dairy Co., at Caldwell, N. J. This is the largest dairy in the United States.

'05, Sp.—Harriett B. Bradner is raising poultry on a farm at Warwick, N. Y.

'05, B. S. A.—Norman Ratchford was in Ithaca attending the Agr. Banquet. He has refused offers to leave the farm, and is doing espec-ially well on his place at West Nanti-coke, Pa.

'06, Ph. D.—M. J. Iorns is horti-culturist at the Porto Rican Experi-ment station.

'06, M. S. A.—Claude I. Lewis has recently accepted the position of hor-ticulturist at Washington. This has been held by Cornell graduates for the past ten years.

'06, B. S. A.—David A. Durward has left his position as horticulturist

and botanist at Farm School in Pa. to a similar position at Mt. Hermon, Northfield, Mass.

'06, B. S. A.—Wilfred G. Brierley is horticulturist at Farm School, Farm School, Pa.

'07, W. P.—Geo. F. Kozel, of Washington, died at the Infirmary on Feb. 28, after an illness of a week. Mr. Kozel had taken up the Poultry course to enable him to take it up as a pastime, having retired from busi-ness. He leaves one son living in New York City.

Ex. '07, Sp.—Arthur P. Loewe left school April 1, to become vice-super-intendent of the Garden Land Co. at Shiocton, Wis. The property con-sists of twelve thousand acres of which 400 will be used as an experi-ment station.

'07, W.—Maurice E. Kent has secured a position with the College Settlement at 108 Ludlow St., of New York City which is widely known for the work it is doing in the slums. A farm is run in connec-tion with the the Settlement, at Mt. Ivy.

'05, M.S.A.—C. S. Wilson. On April 9th the engagement was an-nounced of Miss Ada L. Miller, Vassar '06, of Ithaca, to Mr. Charles Scoon Wilson, '04, of Halls Corners. The *Countryman* gladly takes this opportunity to congratulate one of its former editors, and to wish him the best of happiness and success. Mr. Wilson is Instructor of Horticulture and is also President of the Ontario County Fruit Growers' Association. He is an up-to-date horticulturist. While in the University he was Pres-ident of the Agricultural Association and Editor of the *Countryman*.



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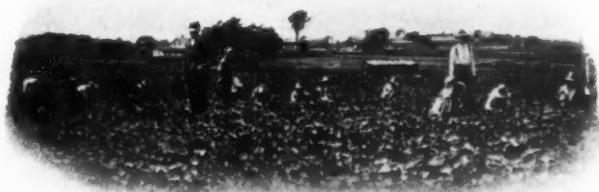
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GOVERNOR HUGHES AND DIRECTOR BAILEY
On the steps of the Agricultural Building, May 27, 1907

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